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BARQUITO BAY, 1½ KM. FROM CHAÑARAL, CHILE, RECEIVING POINT FOR ANACONDA'S POTRERILLOS MINE

Andes Copper Mining Co.'s Development at Potrerillos, Chile

BY JAMES E. HARDING

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Development in Chile by churn drills has determined the existence at the Potrerillos mine of 100,000,000 tons of ore containing 1.4% copper. This deposit is 90 miles from the coast at an altitude of 10,500 ft. Railroad and plant construction and mine development will involve an expenditure of $25,000,000, but it is estimated that in two years' time a level-caving system can be developed to deliver 15,000 tons of ore per day into railroad cars, at a cost of 20c. per ton.

PROBABLY the largest project in mining development at this time is that of the Andes Copper Mining Co.'s Potrerillos mine in the Department of Chañaral, Chile. This mine is in the main range of the Andes, east of the Port of Chañaral, 90 miles from the coast and at an altitude of 10,500 ft. The physical geography of Chile has an important bearing on the transportation problem of this section. There are in that country two main ranges of mountains, of which the lower follows more or less regularly the coast line, and the other the main range of the Andes, or Cordillera. Between the two there is a plain along which has been constructed the main line of the Longitudinal railroad. This plain extends throughout the country from north to south and is of varying width. Across its area at varying distances, running from the furthermost range of mountains to the seacoast, are numerous ancient-river beds, which form natural channels of transportation and drainage from the mountains to the sea. At the sea end of one of the river beds is Chañaral, and at the source the mine of Potrerillos.

A railroad following up the ancient-river bed is now in course of construction to the mine. From the Port of Chañaral to the town of Pueblo Hundido the com-

pany will use the tracks of the state railroad, and from the latter town a new road is being built to the millsite and thence to the mine. The gage is 1 m. and the road is constructed according to the best American practice, using 70-lb. rails. Mallet-type locomotives will operate from the ocean to the millsite, and beyond this point electric locomotives will be used. The last five miles of railroad connecting the mine and mill will be about 75% hard-rock tunnel and will not be in operation for nearly two years. At present practically all the grading to the millsite is completed, steel is being laid, and two steam locomotives are operating over the trackage as completed.

Freight is still transported by mules over a distance of 50 miles, and while many innovations have been added to the system the two-wheeled cart drawn by six mules, according to Chilean custom, continues in favor. These carts have 3½-in. axles and weigh about 3000 lb. without load. The mules are hitched three abreast, and the main responsibility rests upon the one mule between the pair of shafts. The regular load for this unit is 3½ metric tons. From the description it may be imagined that the hauling method is not over-efficient, but it is the best the country had to offer. Those who handle traffic with such conveyances know its real difficulties. Mule drivers are a drunken, turbulent lot, and heat, wind and dust are always present. The man who is responsible for the movement of the freight by this method leads an extremely active and intense life.

It is difficult to realize the tremendous extent of such a project, even when it is considered that $25,000,000 is to be spent before any copper can be produced. The construction work starts at Barquito Bay from the Port of Chañaral, a view of which is shown. A 22,000-kw. steam-turbine electric plant is being installed at this port to transmit power to the mine and mill at 100,000 volts. The port will be equipped with a railroad terminus and docks for steamships.

Next in order is the other end of the railroad where the millsite will be situated. The site selected is in a country of low-rolling sandy hills shown in the accompanying illustration. A 15,000-ton concentrator, and offices and dwellings for the employees, will be erected at the millsite. It is the company's intention to build a model town for 5000 inhabitants. For foreign employees well-constructed houses of the California bungalow type are being built, and, for the natives, far better accommodations than those to which they formerly have been accustomed.

CHURN-DRILL ROADS MARK THE EXTENT OF DEVELOPMENT AT THE POTRERILLOS MINE. THE CENTRAL HILL WILL BE MINED FIRST

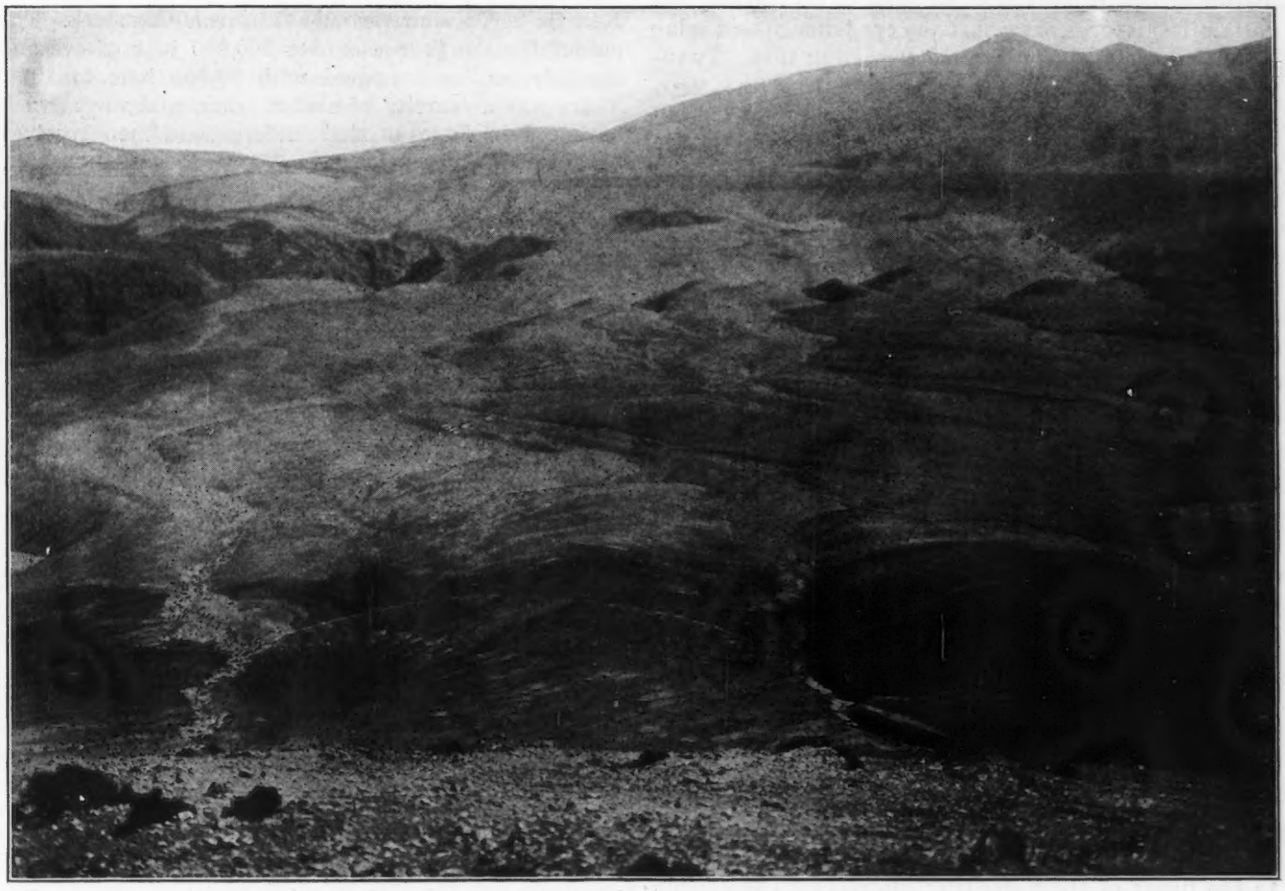
One of the important questions has been water for milling purposes. The desert of Atacama, in which this project centers, yields to none in point of aridity, and it was necessary to go into the mountains, to the regions of everlasting snow, to obtain a permanent water supply. The Ola River is being tapped by a pipe line,

36 miles long, having an average diameter of 26 in. It will furnish water at the rate of 25 cu.ft. per sec. This pipe line is laid in a northeasterly direction, over mountains and across gulches. The construction is partly steel and partly wood stave.

The general surface appearance at the mine can be seen in the photograph. The gradings shown have been made for the movement of churn drills, and at various places over 100 holes have been drilled in establishing the limits of the orebody. The low hill rising in the center is practically over the center of the orebody first to be mined. Roughly this body of ore has been proved by churn drills to be 1800 ft. long, 900 ft. wide and 850 ft. deep, a total of 32,000,000 tons of ore containing 1.5% copper. Additional ore in the vicinity of this body has also been proved to the extent of increasing the total to 100,000,000 tons averaging 1.4% copper. A cross-section of the orebody is roughly an inverted triangle, with altitude and base nearly equal.

The method of mining will be one of low costs. The main haulage tunnel from the millsite terminates under the orebody at a point approximately 1000 ft. below the surface. Above this tunnel ore bins with air- and electrically-controlled gates will be constructed, leaving 150 ft. of pillar over the tunnel through which the ore will be drawn from the caving level. The method will have a caving level superimposed over a grizzly level. It is intended to undercut the entire orebody at the caving level by a series of parallel drifts and then to cave the entire orebody by blasting the pillars between drifts. Study of this method convinced the company's engineers that no difficulty will be met in causing the mass to collapse. It is estimated that the total mining cost will approximate 20c. per ton of ore on board railroad cars at the mine.

The geology of the orebody is simple, a late intrusion of quartz porphyry in limestone. The ore developed was formed as the result of secondary enrichment from a primary impregnation, although ore has also been developed in the primary and oxidized as well as secondary zones. Copper minerals are disseminated both in the jointing planes and as inclusions in the rock. Since its intrusion the magma has been extensively faulted and brecciated and the ore has followed certain zones of fault movement which, though widely separated, have formed channels for the circulation of enriching solutions and boundaries for the ore. The orebodies do not appear to have been materially faulted by subsequent movements.



VIEW FROM THE MILLSITE SELECTED BY THE ANDES COPPER MINING CO., POTRERILLOS, CHILE

The metallurgical treatment has not yet been worked out in detail, but since both oxidized and sulphide ores occur, a combination of leaching and flotation will probably be adopted. It has also not yet been definitely decided whether the company will establish the smeltery at the millsite or at the coast.

Sulphur Exports from Italy are now forbidden, except under special license. The Consorzio Obbligatorio, which controls the Sicilian sulphur industry, is required to make full reports of stocks on hand each month. The production in Sicily has decreased owing to shortage of labor and other conditions arising from the war.

Mining in Utah in 1917

By EDWARD R. ZALINSKI*

THE year 1917, notwithstanding war conditions, was a prosperous one for the mining industry of Utah. Up to July and August production exceeded the rate set in 1916. Thenceforth, however, there was a decrease in output. The shortage of railroad cars and scarcity of labor began to curtail operations, and the unprecedented overproduction of lead and silver ores in June, July and August caused a congestion of shipments at the smelteries, and embargoes were declared to relieve the situation. Uncertainty as to Government price regulation of metals caused mining companies, especially the larger interests, to retrench in the matter of new enterprises. In spite of the various uncertainties, records show that the ore tonnage and value of the output of 1917 were greater than in 1916. Twenty-one Utah mines paid dividends during the year, amounting to $29,410,169, as compared with $24,790,140 in 1916. There were two new dividend payers, the Dragon Consolidated and Tintic Standard, both in the Tintic district.

Demand for Metals Induced Great Output

The ore markets were good, excepting at those times when the smelteries were overstocked. Production of lead and silver ores exceeded by 20% the capacity of the valley lead-smelting plants. The same conditions existed to a lesser extent for copper ores, and the copper smelteries called upon shippers to decrease their tonnages. Heavy shipments began in the spring from accumulated winter stockpiles. Most of the ore was shipped in the summer months, but the weather was so favorable during the fall that heavy shipments continued right up to the end of 1917. There was some decrease in lead shipments following the lowering in price of that metal. According to preliminary estimates the value of the output of copper, lead, and silver was greater than in 1916; the gold production was about the same, and the production in zinc showed a slight decrease.

Bingham, Tintic, Park City, Alta, the Cottonwoods, American Fork, Ophir and Beaver County produced consistently, except as curtailed by the conditions mentioned. Copper producers shipped steadily all year up to the limits of their smelting contracts. The Clifton or Deep Creek district, upon completion of the railroad early in 1917, became a regular contributor to Utah's output of metals.

Park City Production Increased 10 Per Cent.

At Park City there were in all 18 shippers, of which the largest were the Silver King Coalition, Ontario, Judge, Silver King Consolidated, Daly West and Daly. A much larger tonnage than usual was shipped by the Ontario—siliceous silver ore—on account of the higher price of silver. Judge Mining and Smelting Co. opened up important new orebodies in the southwestern part of the property under the Bonanza Flat section, and an orebody unusually high in silver was opened in one of the main veins, in another part of the mine. The new electrolytic-zinc plant was completed on Feb. 1, 1917, and treated about 50 tons of concentrates per day, producing 15 tons of spelter. The Silver King Consolidated started the new 14,000-ft. drainage and development tunnel to open up the Thaynes Canyon section of the property, and advanced over 4000 ft. during 1917. This company's new mill began operations in May and treated from 50 to 70 tons per day. The Three Kings company continued development by crosscutting and sinking from the 500-ft. level. The American Flag was worked by lessees to some extent. The Big Four Exploration and Broadwater mills did not operate after August and September. Other properties that produced were the New Quincy, Naildriver, and California-Comstock. The output for the year was over 100,000 tons of ore and concentrates, as compared with 90,000 tons in 1916. There was a scarcity of skilled labor, and wages were advanced in June so that underground men received $4.25 to $4.75 per day.

Alta, Cottonwood, American Fork and Ophir

The production from Alta was approximately 40,000 tons in 1917. The largest shippers were the Michigan-Utah, the Emma Consolidated, and the South Hecla. The Wasatch mines in June began work on a new drainage tunnel, started in the canyon 5000 ft. from the main workings and drove 1700 ft. in 1917. The Wasatch Power Co., owned by the Wasatch mines, supplied all the district power from a hydro-electric plant. This company connected its lines with a branch line of the Utah Power and Light Co., which was brought in from the Cardiff on Dec. 6. The latter line was held in reserve for the freezing and low-water seasons. The Columbus-Rexall discovered in July a large new bedded body of sulphide ore carrying 8 to 9% copper and 15 to 20 oz. silver per ton. It was opened from 18 to 30 ft. in thickness, and was followed for 200 ft. along the strike. The Alta Consolidated in November drove into an orebody of interest. A new 36-in. gage railroad was completed about Nov. 1 by the Little Cottonwood Transportation Co., from Wasatch, near the mouth of the canyon, to Alta, the upper terminal being at the Howland tunnel dump of the Wasatch Mines Co.; but little hauling was done in 1917. Equipment consists of one 55-ton Shay engine and two more were ordered. The Michigan-Utah shipped over its 4½-mile tramway to Tanners Flat, where the ore was loaded into wagons and hauled three and a half miles to the eastern terminal of the Salt Lake & Alta R.R. Other properties that shipped were the Wasatch Mines, Sells, and Alta Consolidated. About 225 to 250 miners worked in the camp, and in the Cardiff, over the divide in Big Cottonwood, there were 125 more. Cardiff shipped from 100 to 125 tons of ore per day, but was seriously restricted by the smelter embargo and has stockpiled a large tonnage of ore at the mine and in the valley.

In American Fork the Fissures Exploration Co., operating the Pacific mine, increased its mill capacity and toward the end of 1917 was treating 150 tons of ore per day. The Pacific fissure was drifted upon for 700 ft., is 8 ft. wide and has a proved depth of 300 ft. This

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property is the most important producer in the district. The Miller Hill, adjoining, started a new tunnel, which was driven over 2000 ft. and will give a depth of 500 ft. under the old workings. The camp showed unusual activity and a large number of properties were operated.

Activities in Beaver and Tooele Counties

In Beaver County, the Moscow, Red Warrior, Commonwealth, Montreal, Horn Silver and other properties operated during 1917. Lead-silver, copper, and some zinc ores were shipped. At Newhouse the flotation mill of the Utah Leasing Co. treated tailings from the old cactus dump, handling 500 tons a day.

At Ophir, Tooele County, in the Ophir-Dry Canyon section, the principal producers were the Ophir Hill Consolidated, Cliff, Hidden Treasure, New Stockton Mining Co., Utah Queen Leasing Co. and various lessees. At Deep Creek, the new railroad was an outlet for copper, silver-lead, and gold ores, and lesser shipments of tungsten, molybdenum, and bismuth ores. The Western Utah Copper Co. shipped as much as 200 tons per day, and the output of the district has been as high as 300 tons per day. Other properties that shipped were the Seminole Copper, Woodman, Wilson Consolidated, Pole Star Copper, Western Utah Extension, Copperopolis, Christmas and Garrison Monster. There was a scarcity of labor in this district. Some ore was shipped from the Ferber district, after hauling to the railroad at Erickson, 15 miles north of Gold Hill. In the first six months of operation the Deep Creek railroad handled 31,460 tons of ore, most of which was copper.

Tungsten and molybdenite ores were produced by the Seminole Copper Co., though little of the latter was shipped. The tungsten was chiefly in the form of scheelite, although a small amount of wolframite occurred. The Wilson Consolidated and the Copperopolis and various lessees shipped tungsten. Oxidized bismuth ore in less than carload lots was shipped by the Wilson Consolidated. The center of the camp is Gold Hill, or Goodwin, at the terminus of the Deep Creek railroad 43 miles south of Wendover, where the Deep Creek road connects with the Western Pacific.

Tintic Output Limited Only by Market

The output from the Tintic district for the first 11 months of 1917 was 400,000 tons, or about the same as for the entire year of 1916. The mines of this camp produced under difficulties, at times having been seriously affected by the shortage of cars and the smelters' embargoes, especially those in regard to siliceous ores. There was more development than usual in the eastern and northern sections and considerable prospecting by the various companies. The Tintic Drain Tunnel Co. was organized by the Knight interests, to drive a six-mile tunnel from the Goshen slope to the porphyry section at the southern end of the district, at the property of the Dragon Consolidated. In the neighborhood of the Iron Blossom and Dragon shafts the tunnel will have an approximate depth of 2200 ft. Arrangements have been made with owners of property that will be drained to pay a royalty on ores the extraction of which will be facilitated by the tunnel. The heaviest producers were the Dragon Consolidated, Chief Consolidated, Iron Blossom, and Centennial-Eureka.

The Chief Consolidated enlarged the main shaft to two compartment to the water-level depth (1800 ft.), without interfering with production. Some unusually rich ore was found at about water level, and high-grade ore was stoped below water level by pumping. Several cars valued at $10,000 were shipped from this part of the mine. In the Homansville section of this property lessees shipped 39% manganese ore. This company did considerable prospecting and additional property was acquired. The Tintic Standard continued the development of the new orebody on the 1600-ft. level, sunk a new shaft, shipped lead-silver ore and paid two dividends. The Eagle & Blue Bell, controlled by the Bingham Mines Co., developed new ore, and paid dividends. The North Beck Mining Co. prospected for the northern extension of the western ore zone of the camp, on which are located the Eureka Hill, Centennial-Eureka, Bullion Beck, and Gemini. Iron Blossom produced well and sunk one of its shafts to the 2200-ft. level. Some of the smaller Knight properties, including scattered claims, and taking in the Lower Mammoth, were merged into the Empire Mines Co. The Tintic Milling Co. operated at Silver City, treating low-grade Tintic ores by the Holt-Dern process, and made shipments of bullion. There were a number of small producers active in the various camps of the district.

Record Production from Bingham Canyon

The output of Bingham was between 13,000,000 and 14,000,000 tons in 1917. Utah Copper Co. alone shipped a million tons of ore per month. Other important producers were the Utah Consolidated, shipping copper and lead ores; the Utah Apex, United States Mining, Bingham Mines and Utah Metal and Tunnel companies which shipped lead, copper, and some zinc ores. The Utah Apex completed the installation of a new Nordberg hoist, and produced lead-zinc ore and concentrates. This company increased its ore reserves and paid dividends in 1917. The Utah Metal and Tunnel Co., including the Bingham-New Haven, opened a new copper orebody at depth. This company during the latter part of 1917 turned its attention entirely to copper, discontinuing the production of lead pending a better market. Ohio Copper Co. began remodeling the mill at Lark for the flotation process. Minerals Separation machines, Hardinge mills, and Dorr thickeners and classifiers were being installed. The plant is expected to be completed about April, 1918. The capacity will be 3000 tons. Bingham Mines Co. operated the Dalton & Lark mine and produced lead-silver and copper ores. This company did some development work at the Yosemite mine, but did not operate at the Commercial. The Montana-Bingham Consolidated continued tunnel driving under the Fortuna, which property it secured. Low-grade pyritic copper ores were shipped, a mill was built at the Fortuna and concentrates were produced.

Utah Copper Co. operated at full capacity all through 1917, completed a leaching plant for the treatment of oxidized ores, enlarged the tailings pond to cover 6000 acres, and made improvements and additions at both concentrating plants. Approximately 12,555,100 tons of ore were produced for the year as compared to 10,994,000 tons in 1916, and 202,500,000 lb. of copper, as compared with 197,417,480 lb. in 1916.

The fine-crushing department was remodeled and enlarged at the Magna plant and improvements were also

made at the Arthur. The leaching plant was tried out in December, and was expected to start about the first of 1918 with an initial capacity of 4000 tons. The levee around the new tailings pond will be completed around February, 1918. The ultimate capacity is estimated at 500,000,000 tons of tailings, which, however, can be increased if necessary by building the levee higher. On May 10 the Utah Copper reduced the hours of all nine-hour men at the mills to eight hours. At the mine all 10-hour labor, including steam shovel, train, track, and drill operators, was reduced to nine hours. All mechanics previously working nine hours were reduced to eight hours. On July 1 all skilled labor employed at the mines and mills was raised 25c., and all unskilled labor was raised 20c. per day. At the close of the year wages ranged from $3.20 per day for common labor to $235 per month for steam-shovel engineers.

Salt Lake Valley Smelteries Sustain Production

The Salt Lake Valley smelteries operated at capacity all year. The United States Smelting Co., at Midvale, ran seven furnaces on lead ore. The American Smelting and Refining Co., at Murray, had eight furnaces treating lead ore. The Garfield smeltery operated at full capacity. The International Smelting Co. ran its lead plant at full capacity and three or four out of the five copper reverberatory furnaces. On account of accumulation of ores and shortage of railroad cars, it became necessary for the lead smelters to declare embargoes at times in order to catch up with production. While this condition worked a hardship on the mines, the smelters may be said to have held the bag for the metal market in that they bought ore from all comers at high prices, and when well stocked up, through Government request held their lead until it should be known what the Government requirements would be. These requirements were understood to be heavy, and high prices followed. The smelters bought the largest offering of ores that ever came to this market. In the meantime the Government requirements proved to be not so heavy, the price of lead dropped, and the smelters were caught with much ore stockpiled and also with lead bullion on hand and at the refineries. The smelters could have broken even on their lead, if they had not waited.

The Utah Ore Sampling Co. built a new sampler at Murray, and doubled the capacity of its Murray plant, bringing this up to 1200 tons per day. The Silver City sampler of this company treated 800 tons per day. The Park City sampler did not operate. This company sampled the largest tonnage in its history.

Gold, Silver and Lead of Utah

Gold was produced from copper, lead, and mixed ores. Little straight siliceous gold ore was mined, with the exception of a few cars from the Annie Laurie mine, in Sevier County. At Park City, the Ontario and Daly produced siliceous silver-gold ores, and several properties in Tintic, including the Chief Consolidated, Centennial-Eureka, Eagle & Blue Bell, Gemini, and others, produced siliceous silver-gold-copper ores.

Lead ores furnished a large part of the silver. The producers were the Silver King Coalition, Judge Mining and Smelting, Silver King Consolidated, and Daly West companies of Park City, the Utah Apex, Utah Metal and Tunnel, Utah Consolidated, and United States properties at Bingham, and the Tinctic Standard at Tintic. Shipments of lead ore were made from all camps in the state. The Deer Trail Mining Co. built a 100-ton mill at its mine near Marysvale, in Piute County. Construction was started in April, and was nearing completion in December. The ore carries gold, silver and lead. Cyanidation and flotation will be used.

Zinc Shipments in 1917

Moderate shipments of zinc ore were made from Tintic and Park City, Ophir, Dry Canyon, Stockton, and from Beaver County. The Lakeview mine, on Promontory Point, in Box Elder County, shipped carbonate zinc ores. There was also a new producer in this county, the Valley View property, near Kelton, which shipped a car of zinc ore. The principal producers of zinc sulphides, mostly concentrates, were the Judge Mining and Smelting, Daly West, and United States companies. The Midvale Minerals Co. operated a 250-ton flotation plant on tailings from the United States concentrator at Midvale and shipped 25 cars of lead-zinc concentrates per month, the material going to Anaconda. The Childers Leasing Co., working on a different part of the same tailings dump, also with a flotation plant, produced 15 cars of zinc-lead sulphides per month, and shipped to the Kansas gas-field smelteries. The Horn Silver mine, in Beaver County, shipped a few cars of straight zinc-sulphide ore. The Judge Mining and Smelting Co. treated zinc-sulphide concentrates from its mill and produced electrolytic zinc. Carbonate zinc ores were mined by the Moscow and Cedar Talisman, in Beaver County; by the Scranton, in north Tintic; by the Hidden Treasure, in Dry Canyon, and by a number of Tintic properties, including the May Day, Gemini, Yankee Consolidated, and Lower Mammoth.

Manganese, Antimony and Rare Metals

More interest was taken in manganese and molybdenum than heretofore. Some manganese ores were shipped from around Green River. Lessees at the Chief Consolidated, in Tintic, produced manganese ore from the Homansville section of that property. Some good manganese showings were found in the northeastern part of the state near the Wyoming line, and a limited amount of surface development was done. Some of this ore is high grade. During the latter part of 1917 the Ophir Hill Consolidated, at Ophir, shipped some manganese ore of good grade. Practically all of the manganese ores were shipped East. Two cars of antimony ore were shipped by the Stibnite Mining Co. from near Brigham City, in Box Elder County. This company also shipped some lead-silver ore. A small amount of antimony was shipped from near Junction, in Piute County, in the southern part of the state. In general, however, there was relatively little interest shown in antimony deposits, on account of the lowered price, which would hardly allow smaller producers to operate. Some antimony from near Lovelocks, Nev., was marketed through Salt Lake.

There was unusual activity at Deep Creek in rare metals. Wilson Bros. shipped tungsten ore (scheelite), bismuth ore (oxidized, probably carbonate), and made several small shipments of molybdenite from the Seminole Copper and Wilson Consolidated. There was considerable leasing going on during the summer, and various lessees hand jigged and shipped odd lots of tung-

sten. Tungsten ore was shipped by Koker & Allen from Deep Creek. The United Tungsten Co., owning property in Box Elder County near Bovine, made shipments. Some tungsten ores were also marketed through Salt Lake from White Pine County, Nevada, and from Idaho. There has recently been considerable activity in tungsten near Mill City, Nev., and ore from here is also marketed through Salt Lake.

The Alta-Gladstone, in Little Cottonwood, mined some molybdenite. In general there was an active market for molybdenite and a steady market for tungsten, the demand for which picked up in the early spring.

The uranium and vanadium market was quiet in the early part of 1917, but showed increased activity in the later months. Shipments of carnotite ores were made from San Juan County, from near Moab, Green River and Thompsons. Most of this was shipped East, but some was sent to Colorado for experimental work.

Potash was produced from alunite by the Mineral Products Corporation, at Marysvale, in Piute County. This company made steady shipments of potassium sulphate until fall, when its reduction plant was partly destroyed by fire. Rebuilding of the plant was started without delay and included some improvements and minor changes in the mechanical handling of the ore. The Florence Mining and Milling Co., at Marysvale, completed its calcining plant, capable of treating 75 to 100 tons of alunite daily, and began operations in May, shipping calcined alunite to the East. The Pittsburgh-Utah Potash Co., at Belnap, six miles from Marysvale, started work on a potash reduction plant. Crude potash ore was shipped to New Jersey by the Utah Potash Co. The American Smelting and Refining Co. took over the Yellow Jacket claims in Marysvale. The Salt Chemical Co., at Grants, on the southwestern side of Great Salt Lake, and the Utah Chemical Co., at Haskell, near Saltair, operated potash plants, and shipped potash, running up to 9 or 10% KCL, and also other salts.

Mining in Colorado in 1917

BY GEORGE E. COLLINS*

THE conditions that affected the mining industry in Colorado the most during 1917 were the scarcity of labor and the high cost of mine supplies. In some districts these handicaps were partly offset by high prices paid for lead, silver and copper, but in the gold camps, such as Cripple Creek and Central City, conditions were such as to discourage operations. A general 25% increase in wages was granted in the mining districts of the state. In almost every case the advance was made voluntarily by the operators, and it was in most instances accepted by the men.

LABOR STRIKES AT LEADVILLE AND IN THE SAN JUAN

At Leadville, however, the scale first proposed proved unacceptable and a strike occurred, in July, the men demanding an increase in the minimum wage from $3.50 to $4 per day. The controversy was finally settled through the intervention of a Federal conciliation board which decided in favor of the higher wage, but upon the agreement that the 8-hr. working shift should be real and not nominal, as it has been during recent years, and that the demand for recognition of the union be waived. The men probably did not gain much, as several properties doing only development work became discouraged by the advancing cost of operating, and took this opportunity to close down.

The strike at Leadville was followed by a walkout at the Sunnyside mine, at Eureka, and a threatened general strike in San Juan County, the miners contending that the Sunnyside was owned by the United States Smelting, Refining and Mining Co., which was a party to the settlement at Leadville; and that conditions in San Juan County were even less favorable to labor than those at Leadville. A strike was averted only by a 50c. increase in the wage scale agreed upon by the local union, which included a proviso that the charge for board should not be increased above the old basis, which was $1 per day.

Speaking generally, the increase in wages, in the case of married men, particularly married men with children, was not commensurate with the increased cost of living. With respect to unmarried men, as are most of the miners in isolated districts, the situation is the reverse, for boarding-house charges did not advance in proportion to the cost of provisions; partly because of the exercise of a little compulsory thrift. In the San Juan and other districts where company boarding houses were maintained, the charges were not increased, and the service was not lessened, which resulted in a decided loss to these departments and therefore should really have been regarded as the equivalent of additional wages.

With the increased wages, there was a marked decrease in labor efficiency. This was partly because of the labor shortage, as the men realized that employers could not fill the place of an inefficient workman. To a greater extent perhaps, it is because the more energetic men joined the Army, or left for the copper districts, where wages were higher. There was, however, little dissatisfaction in Colorado with the prevailing wage scales, for it was generally realized that but few of the mines could afford higher wage scales.

MINING COSTS INCREASED ABOUT 67 PER CENT.

The cost of mine supplies, machinery repair parts, etc., showed a greater percentage of advance than wages. Everything considered, I believe it is a conservative estimate to say that mining costs have increased 67% since the beginning of the war. Excluding gold, 1917 prices of lead, zinc and silver (copper having been relatively unimportant in Colorado) did not rise in proportion to cost of production.

Perhaps the greatest change in ownership of Leadville properties during 1917 was the sale of the controlling interest in the Yak tunnel to the American Smelting and Refining Co. Developments in this property, in that operated by the Leadville Unit of the United States Smelting, Refining and Mining Co., and in the

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Down-Town group were disappointing. The aggregate output from the district was high in tonnage, but low in grade; and with it is included a considerable tonnage of manganese ore. During the autumn, production was greatly curtailed by car shortage.

At Cripple Creek the Cresson mine maintained its important output of high-grade ore, and the Portland, while no longer a bonanza mine, was still profitable, but the Vindicator was reported as disappointing in depth. Most of the other mines, such as the Granite and Strong, yielded a normal production. Lessees were scarce, and the custom mills, particularly the Golden Cycle, were short of ore. The Roosevelt drainage tunnel advanced steadily, but was worked one shift per day only.

At Telluride, the Tomboy and Smuggler-Union groups did fairly well, and shipped zinc in addition to lead-iron-silver concentrates. In the Smuggler mill cyanidation was superseded by flotation. The Liberty Bell probably had a hard task to make profits under the conditions that existed. Black Bear shipped a large tonnage of ore to the Smuggler mill. Alta was reported sold to the Tonopah-Belmont interests.

Sunnyside and Sunnyside Extension Mines Sold

At Silverton most of the mines operated under lease, and some of the lessees, particularly on the Iowa and Highland Mary, made large profits. Shipments to the Durango smelting plant since the early summer of 1917 were larger than for several years previous. The Sunnyside and Sunnyside Extension mines, above Eureka, were finally sold to the United States Smelting, Refining and Mining Co., and a new mill of 500-tons daily capacity was nearly completed. In this plant preferential flotation is to be used for the separation of zinc from lead and iron, superseding electrostatic separation of the middling. If this new method is successful, the Sunnyside may become the largest mine in the San Juan district. The surrounding country also is capable of a large production of lead and zinc if economic conditions become sufficiently favorable.

At Ouray the Camp Bird deep adit made excellent progress, and was reported to have struck several promising veins that showed mixed sulphide ore. It was driven 8000 ft. from the portal, with 2000 or 3000 ft. yet to drive. The Atlas produced steadily, and there was some production by lessees at the Revenue, although work on company account was being resumed. There was greater activity at Ironton and Red Mountain, and the ore produced was shipped by way of Silverton; and if copper and silver prices remain at a remunerative figure production from this district may increase.

In Clear Creek County there was considerable activity around Georgetown, where production was stimulated during the summer by the high price of lead and improved outlook for silver. The Colorado Central and the Terrible were partly reopened. At Idaho Springs, on the other hand, the mines produce gold mainly, and the scarcity of labor was felt severely.

In Gilpin County the labor shortage was perhaps more acutely felt than anywhere else. A large proportion of the better men left, and the mines could not afford to pay wages in competition with other districts. A mill was in course of construction at the Pittsburg, which for the last few years was the most profitable mine in the county.

In Summit County the dredges operated steadily and were doing well. The Tonopah Placer Co. operated three dredges, one of which was working on leased ground in the upper Swan River valley near the foot of Farncombe Hill. The Reiling dredge continued at work in French Gulch. A 4000-cu.yd. boat was being built by the Yuba Manufacturing Co. of California, for operations on the Blue River above Breckenridge.

Of the underground mines, the principal was the Wellington, which was one of the largest producers of zinc in the state, and was as well a large producer of lead. This property had an extremely successful year. The Iron Mask and the Carbonate mines were reopened during 1917, and the Puzzle made considerable shipments. In Eagle County almost the entire productive area at Red Cliff was acquired, and was operated by the Empire Zinc Co. The Commodore, Amethyst and Creede United, at Creede, were developed below the tunnel level by the American Smelting and Refining Co. At Rico, the Rico-Wellington and Rico-Argentine made a considerable number of shipments of both copper and zinc ores. Lessees also worked in a small way.

Among other important mines in outlying districts were the Doctor, which produced crude zinc-carbonate ore, and the Star, on Italian Mountain, which produced lead-silver ore. The shipments from both mines was hauled to the Crested Butte railroad during the summer. The Anaconda, at Iola, and the Akron, at White Pine, produced copper ore. The Mary Murphy, in Chaffee County, produced lead, zinc and copper concentrates carrying gold and silver, and dropped off in output considerably in 1917. This was the only plant in the state using electrostatic separation of zinc middlings. The Rawley mine, at Bonanza, proceeded with the development already under way, and a large milling plant was planned at Shirley, on the Denver & Rio Grande R.R., between Salida and Marshall Pass, with a long aërial tramway from mine to mill.

Tungsten and Molybdenum

The Standard Chemical Co., at Naturita, treated carnotite ore, and the Primos Chemical Co. at Placerville, worked at full capacity. The Primos company also developed its molybdenite property near Empire, in Clear Creek County, where the company was driving a deep adit and building a mill. Two plants were also under construction for treatment of the extensive deposits of disseminated molybdenite at Climax, north of Leadville. Some production of molybdenite and tungsten was also made from the area between Pitkin and Tin Cup. A shipment of over 50 tons of hübnerite concentrates, containing 70% tungstic acid, was made from Silverton in the early summer, but none was made since.

The main productive area for tungsten was still around Nederland, in Boulder County, where mining was performed largely by lessees, and the ore was hauled to central mills, which usually purchased the concentrates by assay according to a fixed scale. Plants for reducing the concentrates to ferroalloy and to metallic tungsten are in operation at Boulder and Denver. Some barite was mined in Custer County and elsewhere; and fluorspar was regularly shipped from Wagon-Wheel Gap, near Creede, from the Barstow mine, near Ouray, and from the vicinity of Jamestown in Boulder County. Graphite-bearing rock was mined north of Pitkin.

Mining in Idaho in 1917

By ROBERT N. BELL*

STIMULATION of mining, brought about by the high metal prices of the first nine months of 1917, was manifested in Idaho by the extent of exploration and development of new ground. This was especially true of districts outside the Cœur d'Alene. Some promising discoveries were made and numerous shippers of small lots were able to make profits during the high market.

In the Cœur d'Alene district the Bunker Hill & Sullivan million-dollar lead smeltery and refinery at Kellogg was completed in 1917 and was in successful operation from the last of July, producing desilverized lead and fine-silver bars. Increase in the capacity of this plant is receiving consideration.

Railroad Extension to Pine and Beaver Creeks

The extension of the north-fork branch of the Oregon-Washington Railroad & Navigation Co's lines several miles up Beaver Creek to the New Ray-Jefferson mill was completed and served the numerous lead-zinc mines in that part of the district. Extensive development was under progress at the Ray-Jefferson and also at the more recently acquired Amazon-Manhattan group, both properties under management of the Day brothers.

Another new railway branch line nine miles long was started, and three miles of grading was completed up Pine Creek by the same railway company for the purpose of serving several fairly well developed lead-silver-zinc properties in that district. Both districts had a number of splendid prospects, some of which exhibit good grades of combined lead-silver and zinc ore.

Early in 1917 the big electric-hoist installation underground at the Hercules mine was completed. The new shaft from the drainage tunnel at the 2400-ft. level was started in the autumn of 1917, and has attained a depth of 1000 ft., and three new levels were opened where marked changes in the character of ore were noticeable.

At the Hecla mine surface improvements were made and new equipment was installed for a sorting plant. A new vein discovered in the autumn of 1917 was stoped and the ore treated in a rented mill, which increased the total output of the mine to 1000 tons per day. A new 1400-ft. connection was raised to the surface from the drainage level at the extreme eastern end of the property for the purpose of ventilation and safety and to facilitate the working of the east oreshoot. The main shaft was deepened 400 ft., reaching the 2000-ft. level below the drainage adit.

At the Morning mine, belonging to the Federal company, the main shaft was sunk 200 ft., or to a total vertical depth of 3600 ft. One of the best orebodies discovered in the Cœur d'Alene district in recent years was opened on this property two years ago through the extension of its main level westward from the lowest drainage adit. This new ore, however, was tied up since stoping began by a suit brought for trespass, involving an apex controversy between the Federal company and the Star Mining Co., resulting in a legal battle that was tried at Wallace during the autumn in the Federal district court for Idaho by Judge Dietrich. The controversy resulted in driving 2000 ft. of raise to connect from No. 6 tunnel level, where the orebody was disclosed, to the surface near the side lines of the contested claims. Mining, geological and legal specialists were engaged in the preparation of evidence for the trial by both sides. The Morning mine ceased operations early in December because of a slight movement in the main shaft which involved 100 ft. of retimbering to return to proper alignment.

At the Consolidated Interstate-Callahan zinc mine, in the Nine Mile district, improvements in the mill were made and production was maintained at full capacity but with greatly reduced profits, owing to high operating cost and metal-market conditions. The main shaft was sunk several hundred feet, and is now nearly 2000 ft. below the apex of the vein, and the new deep levels continue to respond in the tonnage and quality of clean zinc-lead ore found.

Cœur d'Alene District Employed 5000 Men

At the Bunker Hill & Sullivan mine an additional development depth of 300 ft. in the main working shaft was accomplished, giving a total penetration on the dip of the vein of 4600 ft. In the Cœur d'Alene district, ventilation troubles were experienced as greater depths were attained and definite plans were in progress to meet these conditions as they develop.

The district employed over 5000 men in 1917. Aside from the main points of development mentioned, only limited efforts were made in new work, by reason of the scarcity of labor and the excessive cost of material. The district, owing to the war draft on its young men, was short of miners and would no doubt have suffered still more but for the closing of the Butte mines during the summer. In spite of the labor situation, production was maintained at full capacity, but current development suffered. The most serious difficulty experienced by the big operators was in obtaining a supply of mine timber, caused by the activities of I. W. W. in the logging camps, which developed a rather tense situation during the summer and resulted in bringing in a small company of Federal troops, whose presence had a signal effect on the activities of seditious agitators. Wages were voluntarily raised by the operators early in the year, with the advancing price of lead, to a total bonus of $1.25 per day for miners on a $3.50 base, and have remained unchanged despite a declining lead market.

The boom in lumber prices worked a hardship on users of mine timber, which material increased in cost more than 100% during the last two years. This situation induced the application, where underground conditions permitted, of shrinkage methods of stoping. Changes in ore markets were witnessed in 1917. The important output of clean lead-silver ore produced by the Hecla Mining Co. was marketed at the new Bunker Hill & Sullivan smeltery, at Kellogg, and the product of the Hercules and Tamarack & Custer Consolidated mines was treated at the nearby Northport smeltery in Washington, controlled by the Day brothers, the same interests that control these two big lead-silver properties.

*State mine inspector, Boise, Idaho.

The Tamarack & Custer was idle during the early months of 1917 because of labor troubles, but was in operation after July, and is expanding into one of the important producers of lead-silver ore in the district. This property has a complete new mine plant, and a new aërial tram two miles long connects directly with the Frisco mill on Canyon Creek.

The famous bonanzas of clean lead-silver ore of Cœur d'Alene fame were about to suspend operations at the close of 1917 because of the apparent exhaustion of ore. These properties are the Mace mines, known under the several titles of Standard, Mammoth-Green Hill and Cleveland companies, and they covered a single ore channel that extended for a vertical range of 3600 ft. and a length of 1000 to 1500 feet.

The Last Chance mine, at Wardner, was mined downward to the limits set by the courts where the orebodies converge at the Kellogg tunnel level, and it was worked over again upward to the surface, rapidly becoming unprofitable and likely to suspend operations soon.

Outside of the Cœur d'Alene district the Idaho-Continental mine, near the Canadian boundary, made a splendid production of 80 cars of clean lead-silver concentrates and crude ore under adverse transportation and power conditions, and closed the year with bigger ore reserves than it had at the start.

Activity of Mines in Central Idaho

In Idaho County, near Elk City, the Oro Grande Mining Co. completed the construction of a 300-ton per day all-sliming cyanide mill for the sampling and testing on a working scale of a zone of sheared granite several hundred feet wide, that by careful hand sampling averaged $2.50 per ton in gold. The ore is soft and admirably suited to rough selective mining by steam-shovel methods. About 40 miles south, in the Marshall Lake district, the Holt mine operated steadily with a new 25-ton mill which was reported to have made a gold production valued at over a quarter of a million dollars from a vein two to five feet wide of an average battery-feed grade of $35 per ton in free gold and a considerable quantity of rich gold concentrates. The total gold production in Idaho in 1917 was about 41,000 ounces.

At Boulder Creek, near Silver City, in Owyhee County, a concentrating mill was built for 100 tons' daily capacity by the Demming Mines Co., for the treatment of ore from a series of fissure veins in granite. The best vein developed is from 6 to 10 ft. wide and exhibits an oreshoot nearly 300 ft. long containing gold and silver in combination with a finely disseminated arsenical sulphide in hard white quartz.

At the Star mine, on Wood River, a 150-ton concentrator was built a year ago by the Federal company, of Wallace, and underwent several modifications and changes in order to make a separation of complex lead-zinc ore and a decided step toward greater saving was made. In the same vicinity the Federal company recently acquired the Independence mine. This property had a vein parallel to that of the Star, and it had a sharply contrasted ore that made shipments of both crude-ore and concentrates of clean galena free from zinc or other sulphides and carried 60% lead with 100 oz. silver and several dollars in gold per ton.

At Mackay, in Custer County, the Empire Copper Mining Co. enjoyed the most productive year of its history in the shipment of crude ore, and definite progress was made toward plans for further expansion. These plans included the completion of installation of a 1500 cu.ft. air compressor, the near completion of a three-mile aërial tramway, with a maximum capacity of 125 tons per hour, and contracts for the driving of two four-compartment raises 500 and 900 ft. high, respectively, to connect the deep workings with the surface, where there is a large 1½ to 2% ore dump.

Another interesting copper-mining enterprise was that of the Copper Basin Mining Co., about 15 miles west of Mackay, embracing a somewhat similar great zone of mineralization having good surface indications of possibly high-grade copper oxide and carbonate ores. An important body of 3% copper sulphide ore 30 ft. thick was found in the course of development in 1917 and is of exceptional promise. The mine was equipped with a 50-hp. compressor and a crosscut tunnel was driven that attained a length of 1000 feet.

Lead-Silver Ores Near Mackay

The most important mineral disclosure of central Idaho in 1917 was made on the Kennedy and Horseshoe properties, adjoining the Empire copper mine on the west at Mackay. A series of contacts between intrusive porphyry and a blue limestone bears hopeful evidence of a new and large tonnage of lead-silver ore of desirable grade. One of these properties, energetically operated under a lease by P. J. Keenan and recently optioned to the U. S. Smelting, Refining and Mining Co., produced 10,000 tons of crude ore, which was shipped to a Utah smeltery between March and October and contained 6 to 10% lead carrying 1 oz. of silver per unit and rendered marketable in a crude state by virtue of the high metal prices that prevailed, and the fact that the ore had a high excess, nearly 40%, of brown oxide.

The Horseshoe shipments from leasing operations aggregated about 3000 tons, with a grade around 25% lead and 15 oz. silver per ton. Half a dozen other prospects in the same vicinity made small shipments of similar grade.

Developments Along the Salmon River Region

Further west, in Custer County along Salmon River, the Red Bird lead-silver mine, after an idleness of 10 years, was operated by lessees, who shipped about 20 carloads of high-grade crude ore containing 30 to 50% lead carrying 1 oz. of silver per unit. The old Ram's Horn Mine, at Bayhorse, was another revival of a silver mine which had been inactive for 15 years, and a number of carloads of gray-copper ore carrying about 200 oz. silver per ton was shipped. This is one of the best developed and deepest known deposits of gray-copper ore, having a proved reserve estimated at 20,000 tons.

Activity in prospecting prevailed all along this part of the upper Salmon River, and some interesting discoveries were made. In this district 1917 also records a revival of interest in the old Vienna silver camp and the construction of a 50-ton mill.

The Wilbert mine, in Butte County, on little Lost River, installed a new electric hoist and compressor plant and started the straightening of its incline shaft from the 800-ft. level. Steady production was made at this property, the grades in silver increasing nearly 200% below the 600-ft. level.

In the Gilmore district in Lemhi County the 1917 production was materially lower than that of 1916 because much of the operating activity here was devoted to development and equipment. The Pittsburg-Idaho mine installed a 250-hp. gas-engine plant, a double-drum electric hoist, compressor and station pump, and completed a new 50° incline shaft 700 ft. deep. A 6000-ft. tunnel was driven to the Latest Out vein, on the Gilmore company's property, and exploitation began at the new point of penetration, which is 1000 ft. below the apex.

The Latest Out mine developed a new level at 600 ft. and disclosed the most extensive and richest ore of its history, while the bottom level of the Pittsburg-Idaho at 700 ft. presented the best indications of ore recorded by the enterprise. A strong flow of water at that horizon, however, involved the improvements mentioned. Further west in Lemhi County the Anderson mine, at Worthington Creek, drove a long crosscut tunnel, and a number of carloads of crude 10% copper ore was shipped from the upper levels. The total lead production of Idaho in 1917 is estimated at 400,000,000 lb. and of silver about 12,900,000 ounces.

Cobalt Mill on Blackbird Creek

At Blackbird Creek, west of Salmon City, the Haynes-Stellite Co., of Kokomo, Ind., acquired a large group of claims, showing big veins of cobalt-sulphide ore containing some nickel. A 50-ton concentrating mill was completed late in 1917 on this property, and its development is well under way. East of Salmon City, at Carmen Creek, a disseminated deposit in porphyry was developed over an area 600 x 800 ft. to a maximum depth at one point of 100 ft. and is believed by the operators to contain average grades in primary zinc sulphide and in addition some gold and silver. Plans for the immediate erection of a 400-ton concentrating and cyanidation mill, I am advised, were recently consummated, and the property financed for the treatment of the ore. This disseminated ore is something new in this region and rather emphasizes the wide distribution of the zinc mineralization. Further development would seem in order, however, before the promotion of ambitious milling plans. The zone in which the ore occurs is traceable for miles along the foot of the main range of the Rocky Mountains east of Salmon City, and shows interesting evidence of copper dissemination at several points, with some content of gold and silver that in some instances may warrant prospecting by drill. Considerable diamond-drill work was done in 1917 on disseminated copper ore in porphyry, and prospecting in the Seven Devils district, in Adams County, will likely be continued during 1918. The Iron Dyke mine, across the Oregon-Idaho line, has been a steady shipper for the last two years and had a decidedly profitable year in 1917. It was developed to the 1000-ft. level, 100 ft. below the level of Snake River, and is said to disclose a deposit 150 ft. wide of relatively high-grade concentrating ore. In the deeper workings of this property there are some interesting indications of bornite and covelite following pyrite and chalcopyrite. These disclosures greatly stimulated interest in the Oregon district and substantiate the belief in the probable permanency of the deposits on the Idaho side of the river where similar geologic and mineralization conditions prevail.

In Boise County a 100-ton quartz mill was completed on the Lucky Boy mine, near Idaho City, and a 25-ton concentrating mill was put in commission at the old Banner mine, 20 miles northeast of Idaho City. The latter property was purchased by prominent Spokane operators, and is said to have a developed ore reserve of 3,000,000 oz. of silver in the form of sulphide occurring in an oreshoot 600 ft. long and of equal maximum depth. Several shipments of selected crude ore containing 300 oz. of silver per ton were made from this property, and a small car of concentrates was shipped that assayed over 900 oz. of silver per ton.

The Teton Valley Coal Co.'s property near the Wyoming line in eastern Idaho was recently sold for $100,000, and its development was undertaken by the new owners. This is the only bituminous coal deposit of commercial importance so far disclosed in Idaho. A responsible engineer estimates its reserves at 4,000,000 tons to a depth of 500 ft. on a series of steep-pitching seams. Practically all of Idaho's coal requirements are now imported from Utah and Wyoming. This deposit is identified with the famous Kemmerer horizon, and it is believed will materially relieve the fuel situation if development progresses favorably.

Active interest was revived in two of the phosphate-rock deposits of Bear Lake County, in southeastern Idaho, in 1917, and several thousand tons of rich rock was shipped to California points, with large contracts ahead for 1918 for export to the Hawaiian Islands.

New Mining Legislation Embraces Compensation and Dust-Catching Devices

A legislative enactment affecting the Idaho mining industry, passed at the last sesion of the Idaho Legislature early in 1917, was the Workmen's Compensation Act, known as Senate Bill No. 221, Chapter 81, Session Laws of Idaho, 1917. This law is applicable to all hazardous industries in Idaho as well as to mining. The act took full effect on Jan. 1, 1918, and involved the appointment of a nonpartisan Compensation Commission Board, consisting of three members at a salary of $3000 a year each and an Insurance Commissioner at a salary of $4000. The act provides a specific schedule of payments based on the Montana statute, in effect for the last three years, and is in many respects similar to that law, which has proved satisfactory to the mining industry of that state.

Another bill especially affecting the operation of mines, and entitled House Bill No. 25, which became effective on and after its passage in March, 1917, made it a statutory requirement that mine operators shall provide dust-catching devices on stoping or all other machines in dry ground. This law imposes a severe penalty on the operator who does not provide the device and on the miner for not using it when it is provided. Because of the scarcity of labor, the enforcement of the law has been difficult. The device employed has been usually in the form of a small injector spray attached to the machine and involving the use of a can of water and a small suction hose. The protection appliances have been liberally supplied by the operators and in some of the mines their use was well observed; in others the men deliberately disregarded their presence and seemed willing to eat dust in preference to adjusting and operating the device. Where its use has been enforced, it is the

opinion of operators that just as much ground or more can be cut with the dust-catching device as without it, and as labor conditions become more normal the enforcement of the law will doubtless be insisted upon, as its object is to promote the efficiency as well as to protect the health of the workmen.

William Hague

"Of pneumonia, on Jan. 2, 1918, while on service in France for his country, Lieut. William Hague, 116th Engineers, son of the late James D. Hague, in the 36th year of his age." Thus read a death notice in the papers a few days ago, which conveyed a shock to many people in this country, especially to many mining men, who knew William Hague as one of the best, most accomplished and most lovable of our younger mining engineers.

Lieutenant Hague was born in Orange, N. J., 35 years ago, the son of the late James D. Hague, a very distinguished mining engineer, and Mary Ward (Foote) Hague, of Guilford, Conn. He attended Milton Academy, Milton, Conn., and was graduated from Harvard in the class of 1904. He was a nephew of the late Arnold Hague, of the United States Geological Survey. Seven years ago he married Elizabeth Stone, of Milton, who with their son, James D. Hague, six years old, survives him. He was a member of the Harvard and Engineers' Clubs, of New York, and also a member of the Mining and Metallurgical Society of America.

WILLIAM HAGUE

Lieutenant Hague's mining career began immediately after his graduation from Harvard, when he went to Bisbee, Ariz., to be a surveyor's helper in the mines of the Copper Queen Consolidated Mining Co. In 1905 he became an instrument man, being engaged on the construction work of the Copper Queen smelting plant at Douglas, Ariz. In the latter part of the same year he was transferred to the geological department of the company, being occupied in that work until May, 1906. The summer of 1906 was spent in prospecting in Michigan; but in the autumn he returned to Arizona as assistant in construction of the Copper Queen plant at Douglas, and remained on that work until October, 1907. The autumn and winter of 1907-08 he spent in traveling in the United States and Mexico, his purpose being to broaden his experience; wherefore he proceeded leisurely, occasionally taking a position for a short time. Thus, for two months he was employed as a shift boss in the cyanide plant of the Guanajuato Consolidated and Milling Company.

A serious illness that befell him in 1908 kept him from work during the major part of that year, but upon his recovery, in December, he was appointed managing director of the North Star Mines Co., a famous and successful gold-mining enterprise on the Mother Lode in California, with which his distinguished father had been identified for a great many years, and in which William Hague was the natural successor to his father.

However, William Hague could not keep away from purely professional activities in directions wherein he was intensely interested, and during a considerable part of 1909 and 1910 he was engaged in geological work at Bisbee, Ariz., for the Copper Queen Consolidated Mining Co., making occasional trips to Grass Valley, Calif.

From June 1910, up to the time when he entered the United States Army, Mr. Hague resided at Grass Valley as managing director of the North Star Mines Co.; but during 1911 he joined J. R. Finlay as assistant in the appraisal of copper mines for the State of Michigan.

Lieutenant Hague attended the Officers' Training Camp at Plattsburg in September, 1916. After receiving his commission, he was called to the Engineers' Training Camp at Vancouver Barracks, Oregon, last spring. Later he was transferred to the camp at American Lakes, near Tacoma, and from there to Charlotteville, N. C. He was ordered with his regiment to Mineola last November, and soon afterward left for France. His family received news of his safe arrival abroad Dec. 15 last. Since then a cable of Christmas greetings to his family was the only word received.

In the *Evening Post* a few days ago there was a tribute from an anonymous friend which is so poetic and so true that it may well be repeated:

"A few short weeks ago there was the bustle of camps; then a great silent flitting of our boys going 'over there,' and now there are commencing the first brief lists of those who are to lie in the torn fields of France. Today we read of Lieut. William Hague, whom we said good-by to hardly more than a month ago—so clean, so young, so strong—who, abandoning the professional career in which he had won such commendation and which held for him such promise, leaving his wife and his little boy to whom he was so dear, answered at once the call for men of his training, and is new dead 'in the service of his country.'

"There are many friends of that courtly and dignified gentleman James D. Hague who recall, both here and in Stockbridge, the parental pride in the promising lad of such a little time ago—the eager schoolboy at Milton, the rather grave youth at Harvard, his entry into new experiences in the Western mining world, and who, seeing him during his stay at Camp Upton, realized that the old Puritan stock was still sound and true—and now with him the struggle is over and the sacrifice made."

Bill To Control War Minerals

By The War Minerals Committee
William Young Westervelt, Chairman

The following is an explanation of the proposed legislation for Government control of the mining and mineral industry:

Since its organization in July, 1917, the War Minerals Committee has been studying some important phases of the mineral industry and its relation to winning the war. Out of this has come a realization that there is imperative need for more definite coördination than is possible without direction by some Governmental agency. No privately controlled industry can have the detailed knowledge of war needs or control of all its supplies and markets to be able to effect the adjustment of its activities necessary for war purposes. Shortages of essential minerals will ensue unless immediate steps are taken to stimulate and develop the mining activities needed. To authorize this necessary Governmental activity the committee has drawn a bill which has been presented to the Mines Committees in both houses of Congress, and to the various war boards interested in this matter. It is believed that the control of the mineral and allied industries provided must be authorized either by the passage of this bill, or by incorporating it in some broader piece of legislation, if the industries concerned are to be enabled to bring their full energies to bear on the winning of the war.

The bill is modeled on the Food Control Act and extends its provisions to cover the mineral industry and those industries whose materials come from it. The objects of the bill are briefly explained in the following outline of its sections:

Sec. 1 gives the President power to carry out any or all of the provisions of the bill whenever it is necessary, in his judgment, for the winning of the war. It defines "necessaries" as ores and minerals, products derived therefrom, and chemicals.

Sec. 2 empowers the President to create and use the organizations necessary for carrying out the provisions of the bill.

Sec. 3 is exactly like that in the Food Control Act which forbids any person carrying out the provisions of the bill from being pecuniarily interested in any contract made under it.

Sec. 4 makes it unlawful to destroy or willfully waste "necessaries," or to hoard or monopolize, or to limit distribution or production of such articles.

Sec. 5 empowers the President to license the importation, mining, manufacturing, storage, or distribution of the articles covered in the bill; and to regulate the licensees as may be necessary. This section is the one under which much of the coördination needed would be effected. It would not entail Government operation, but would leave the business in the owner's hands and would not necessarily go further than to direct his activities in a way most effective for winning the war. The committee believes it is necessary for the President to have this authority in order to make possible the curtailment of the waste of labor and material in the production of unnecessary luxuries.

Sec. 6 forbids the hoarding of products of the mineral and allied industries and defines hoarding as the accumulation of supplies (a) not reasonably needed for the business of the owner, or (b) for the purpose of maintaining prices.

Sec. 7 gives the President power to condemn and sell hoarded articles.

Secs. 8 and 9 are penalty clauses, exactly as in the Food Control Bill.

Sec. 10 empowers the President to requisition such articles as are covered by the bill, and means are provided for justly compensating the owner. The necessity for this section lies in the fact that unwise or unpatriotic persons otherwise might be able to insist upon directing their products to non-essential uses.

Sec. 11 provides the power to buy, store, and sell the articles covered by the bill. One of the most obvious needs to be served by this section will be the stimulation of small producers. Minerals of critical importance oftentimes occur in small deposits. Difficulty and misunderstanding between buyer and miner result in discouraging the miner, and production is only a fraction of what it would be if the Government were to buy the ores at a standard fair price and control the market. Proper action under this section would go far to help fill the country's demands for mica, graphite, chromite, manganese, tungsten, and other minerals that are found only in small deposits.

Sec. 12 authorizes the President to take over and operate any mineral deposit, mine, or plant. This power should, in general, be used as the last resort, when other powers fail. It must be available for emergencies, however. One important deposit of a much-needed mineral which must be imported at present is not operating because of litigation. The Government must have power to take over and operate when such difficulties prevent private operation.

Sec. 13 gives the President power to prevent speculation in and the manipulation of prices for all articles covered by the bill.

Sec. 14 gives the President the authority to fix minimum and maximum prices for articles covered by the bill. There are two fundamental industries on which the conduct of the war depends—farming and mining. It is just as important to make sure of sufficient of the necessary metals as it is to be sure of food. To get them it is necessary, in some cases, that a reasonable minimum price be guaranteed for a reasonable time. Maximum price-fixing for coal has already proved to be desirable.

Sec. 15 permits the President to limit, regulate, or prohibit the production or use of any article covered by the bill. Under this, it will be possible to prevent the use of some war essential in making things that the country can well do without—to prohibit the use of platinum in jewelry, to limit the use of steel in building if necessity demands, and to stop the use of tin for containers of dry substances.

Sec. 16 imposes a penalty for resisting an officer enforcing this law.

Sec. 17 appropriates $5,000,000 for administering this act.

Sec. 18 appropriates for operation of the general provisions—working capital—$150,000,000.

Sec. 19 provides that no employees shall be exempt from draft.

Sec. 20 directs that annual reports of work done and details of expenditures shall be made.

Secs. 21 and 22 consist of the necessary provisions for interpreting the act.

Sec. 23. The termination of the act is provided for as soon after the close of the war as, in the judgment of the President, the agencies created can cease their activities and turn business back into regular channels.

State Geological and Mining Officials

The following lists of the directors of state geological surveys and of the chiefs of state mine inspection bureaus constitute a convenient reference. The lists were compiled in December, 1917, from the latest information available at that time.

It will be seen that of the 48 states of the Union, 36 have organized geological surveys.

A. H. Purdue, State Geologist of Tennessee, died on Dec. 12, 1917. His successor has not yet been appointed.

STATE GEOLOGISTS

Alabama—Eugene A. Smith, University.
Arkansas—N. F. Drake, Fayetteville.
Connecticut—Herbert E. Gregory, Superintendent State Geological and Natural History Survey, New Haven.
Colorado—R. D. George, Director, Boulder.
Florida—E. H. Sellards, Tallahassee.
Georgia—S. W. McCallie, Atlanta.
Illinois—F. W. DeWolf, Director, Urbana.
Indiana—Edward Barrett, Indianapolis.
Iowa—George F. Kay, Des Moines.
Kansas—Raymond Moore, Lawrence.
Kentucky—J. B. Hoeing, Frankfort.
Maryland—Edward B. Mathews, Baltimore.
Michigan—R. C. Allen, Lansing.
Minnesota—W. H. Emmons, Minneapolis.
Mississippi—E. N. Lowe, Jackson.
Missouri—H. A. Buehler, Rolla.
Nebraska—E. H. Barbour, Lincoln.
New Jersey—H. B. Kümmel, Trenton.
New Mexico—Charles T. Kirk, Albuquerque.
New York—John M. Clarke, Albany.
North Carolina—Joseph Hyde Pratt, Chapel Hill.
North Dakota—A. G. Leonard, Fargo.
Ohio—J. A. Bownocker, Columbus.
Oklahoma—C. W. Shannon, Norman.
Pennsylvania—R. R. Hice, Beaver.
Rhode Island—Charles W. Brown, Providence.
South Carolina—Stephen Taber, Columbia.
South Dakota—Freeman Ward, Vermillion.
Tennessee—(Not appointed), Nashville.
Texas—J. A. Udden, Director, Bureau of Economic Geology, Austin.
Vermont—G. H. Perkins, Burlington.
Virginia—Thomas L. Watson, Charlottesville.
Washington—Henry Landes, Seattle.
West Virginia—I. C. White, Morgantown.
Wisconsin—W. O. Hotchkiss, Madison.
Wyoming—L. W. Trumbull, Cheyenne.

STATE MINE INSPECTORS, COMMISSIONERS, ETC.

Alabama—C. H. Nesbitt, Chief Mine Inspector, Birmingham.
Alaska—Sumner S. Smith, U. S. Mine Inspector, Juneau.
Arizona—G. H. Bolin, Chief Mine Inspector, Phœnix; Charles F. Willis, Director, State Bureau of Mines.
Arkansas—John H. Page, Commissioner, Bureau of Mines, Manufactures and Agriculture, Little Rock; John T. Fuller, State Mineralogist; Robt. Boyd, Jr., Mine Inspector, Fort Smith.
California—F. McN. Hamilton, State Mineralogist, San Francisco; H. M. Wolflin, Chief Mine Inspector, San Francisco.
Colorado—Fred Carroll, Commissioner; James Dalrymple, Chief Inspector of Mines, Denver.
Idaho—R. N. Bell, State Mine Inspector, Boise.
Illinois—Evan D. John, Director, Department of Mines and Minerals, Springfield.
Indiana—Michael Scollard, Mine Inspector, Indianapolis.
Iowa—L. E. Stamm, Secretary, State Mining Board, Des Moines.
Kansas—Fred Green, State Mine Inspector, Pittsburg.
Kentucky—C. J. Norwood, Chief Inspector of Mines, Lexington.
Maryland—John L. Casey, Mine Inspector, Frostburg.
Michigan—Duncan A. Reid, Mine Inspector, Flint.
Minnesota—F. A. Wildes, Chief Mine Inspector, Crosby.
Missouri—George Hill, Chief Mine Inspector, Bevier.
Montana—John Sanderson, State Mine Inspector, Helena.
Nevada—A. J. Stinson, State Mine Inspector, Carson City.
New Mexico—W. W. Risdon, State Mine Inspector, Albuquerque.
New York—W. W. Jones, State Mine Inspector, Albany.
North Dakota—J. W. Bliss, State Engineer, Bismarck.
Ohio—L. D. Devore, Chief Deputy, and Safety Commissioner of Mines; Industrial Commission of Ohio, Columbus.
Oklahoma—Ed Boyle, Chief Inspector, McAlester.
Oregon—H. M. Parks, Director Bureau of Mines and Geology, Portland.
Pennsylvania—James E. Roderick, Chief, Department of Mines, Harrisburg.
South Dakota—Otto Ellerman, State Mine Inspector, Lead.
Tennessee—R. A. Shiflett, Chief Mine Inspector, Nashville.
Texas—B. S. Gentry, State Mine Inspector, Rockdale.
Utah—Robert Howard, State Mine Inspector, Salt Lake City.
Virginia—A. G. Lucas, State Mine Inspector, Richmond.
Washington—James Bagley, State Inspector of Coal Mines, Seattle.
West Virginia—Earl A. Henry, Chief, Department of Mines, Charleston.

James W. Malcolmson

James W. Malcolmson, a well-known mining engineer, died on Dec. 26, 1917. Mr. Malcolmson was born in England. He was Whitworth scholar from 1886 to 1889, and studied at the Royal School of Mines, in London, from 1890 to 1893. Completing his studies, he went to Mexico, first as assistant mining and mechanical engineer to the Michoacan Railway and Mining Co., but soon afterward he became mining engineer for the Consolidated Kansas City Smelting and Refining Co., for which company he worked in Mexico, Arizona and Texas until 1898. Upon the organization of the American Smelting and Refining Co., Mr. Malcolmson became the manager of its mining department in Mexico, which position he filled until 1902. From 1902 to 1909 he was consulting mining engineer of the United States & Mexican Trust Co., and from 1909 to 1910 consulting engineer for the Lucky Tiger Combination Gold Mining Co., making his headquarters in Kansas City. From that time onward Mr. Malcolmson maintained his office in Kansas City, where he was engaged in general consulting work. He was an engineer of sterling qualities and of high reputation.

Taxes on Metal Exports from Mexico

WASHINGTON CORRESPONDENCE

Taxes on metals that may be exported from Mexico during January, 1918, have been announced as follows: Gold, $21.46 per lb.; silver in bars or ingots, 63½c. per lb.; silver associated with other minerals or in concentrates, 88⅜c. per lb.; copper in bars or ingots, 1½c. per lb.; copper associated with other metals or in concentrates, 1.42c. per lb. The rate of taxation mentioned in the foregoing has been reduced to U. S. currency.

Graphite Mining in New York

BY D. H. NEWLAND*

Graphite mining in the Adirondacks was stimulated into new activity by the recent market developments. For a number of years the industry had shown little tendency to growth; in fact, it had continued practically stagnant ever since the collapse of the many ill-founded ventures that were started during the boom period of 1905-1910. The present revival had the support of more favorable trade conditions than at any previous time; development is being conducted along conservative lines, and so is likely to show a degree of permanency.

The production of the district last year is estimated at 5,500,000 lb. of flake graphite. This represents a gain of nearly 50% for the twelvemonth and is about double the normal total of earlier years. It is difficult to establish an average of the prices received for the product, since these depend upon conditions, which vary with the output of each mine. For the mill concentrates which contain 75-80% carbon the general average would be about 7-7½c., but for the best quality refined flake the prices were, of course, considerably higher. The refining process, as a rule, makes three different grades from the mill product, the grades depending upon the size and purity of the flake. The individual qualities vary considerably among the different mines. One of the Adirondack companies reports the following average prices: No. 1 flake, 88% carbon, 12½-15c.; No. 2 flake, 82% carbon, 9-12c.; dust, 40% carbon, ¾c. per pound.

The active mines were the American, of the Joseph Dixon Crucible Co., which has been operated for the last 40 years; the property of the Graphite Products Corporation near Saratoga Springs, which began operations in 1916, and the mine near Whitehall, of Hooper Brothers, who started production for the first time last summer. In addition, some development was carried out at Greenfield, Saratoga County, by the Flake Graphite Co., which took over the holdings of the Empire Graphite Co. Plans were considered, also, for the opening of the Faxon properties, which lie on the borders of the American mine and hold the extension of the beds so successfully worked by that enterprise. The developments in progress, if actually made effective, will soon raise the output to 10,000,000 lb. a year.

In spite of the commercial success that is indicated by the recent operations, there is much that may be done to improve the conditions of the industry, especially with reference to the technical methods employed in the recovery of the graphite. One of the impediments that caused so many wrecks in the earlier period of development was the lack of an efficient process. The scheme of milling which has been most successful undoubtedly is that developed by William Hooper, the first manager of the American mine, and since adapted by his son, George H. Hooper, with some improvements, for the Saratoga and Whitehall plants. This depends upon wet methods of separation, after reducing in stamps or rolls, the graphite being floated off from the heavier ingredients by treating the material in stationary buddles. Shaking tables may be introduced as a preliminary step to remove the bulk of the heavy minerals. The middlings from the first buddle are retreated and the process is repeated until the product is brought up to 75% carbon or more. The flake is then dried, bolted and for further treatment subjected to refining, which consists in grinding and bolting, supplemented by separation with the aid of air currents or by water flotation. The use of oil flotation or of electrostatic methods has not as yet been introduced in the Adirondacks.

One of the difficulties in the mill process inheres in the extreme contrast between the graphite and its gangue with respect to hardness. The containing rock of the Adirondack graphite is a compact quartzite or quartzose schist which has undergone intense metamorphism with recrystallization from the original conditions, which was that of sandstone or silt. To release the soft graphite without flouring much of it is a problem not yet satisfactorily worked out. Crushing wet with stamps, which allows the graphite to float off as soon as released from the gangue, is one method introduced with this end in view. There is still much opportunity for experimentation and possible improvement in mill practice, and probably after a time something approaching a standard practice will be worked out.

It is a partial recompense for the hardness of the ores that the crystalline texture of the graphite is so well developed. This is conditioned very likely by the thorough change that the rock matrix has passed through. In size of flake the Adirondack ores are superior to those of the other districts in the Appalachian belt. The percentage of carbon ranges up to 8 or 10% and in restricted beds may run 15%; the average, however, is around 4 or 5%. This means a mill recovery of 80 to 100 lb. to the ton, which may seem anomalous at first, but finds explanation in the fact that the impurities in the concentrates about counterbalance the losses occurring in the process.

*Assistant state geologist, Albany, New York.

Graphite in Ontario in 1917

BY THOMAS W. GIBSON*

The production of refined graphite in Ontario for 1917 was about 4000 tons, comparing with 3446 tons in 1916. About one-third of the product was flake, the remainder being dust or foundry plumbago. Three companies carried on mining and milling operations: Black Donald Graphite Co., Ltd., at Calabogie; Globe Graphite Mining and Refining Co., Ltd., at Port Elmsley, and the National Graphite Co., Ltd., of Toronto.

The Black Donald deposit occurs in white limestone, through which a vertical vein of graphite strikes northeast, varying in width from 7 to 22 ft. It is a large and important body, and has been worked since 1895. It lies on the shore of Whitefish Lake in the Township of Brougham. Water power on the Madawaska River is utilized in mining and milling operations.

At the Globe company's property the country rock is a gray crystalline limestone, through which runs a series of graphite-bearing zones or veins, the two main bodies lying parallel with an east strike, the others cutting across at different angles. The graphite occurs disseminated through the limestone, and is mostly in flake form. The mine is at Oliver's Ferry, on the Rideau Canal, North Elmsley Township.

*Deputy Minister of Mines for Ontario, Toronto, Canada.

The National Graphite Co., Ltd., was organized in the spring of 1915, and is an amalgamation of the interests held by Messrs. Matthews and Foster in certain lands in Hastings County, and the mining and milling interests of the New York Graphite Co. The mine is in the Township of Monteagle, and the mill at Mumford's. The graphite is of the flake variety disseminated in a limestone gangue, and is easily concentrated.

Large flake at the end of the year was selling at 16c. per lb.; small flake at 13 or 14c. and dust at about 2½c. Present conditions favor the growth of the Canadian industry, but developments in Alabama and in the Adirondack region of New York promise strong competition in the United States. There are several other known graphite deposits in eastern Ontario, which are not at present being actively worked.

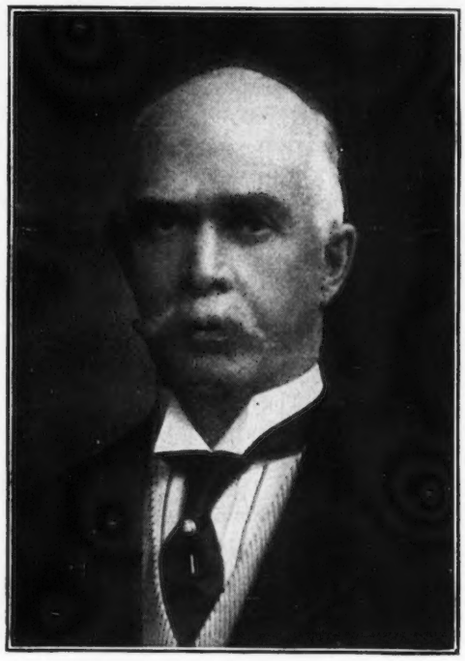
Albert Allmand Blow

Albert Allmand Blow, mining engineer of international reputation, died at his residence in Knoxville, Tenn., on Jan. 2, 1918. He became ill while in New York, six weeks previously, and was taken to a hospital in Baltimore, where he received treatment for septic pneumonia. Improving somewhat, he was removed to Knoxville, where it was thought that he would recover; but hopes were disappointed.

Mr. Blow was born in 1858, the eldest son of George Blow and Elizabeth Allmand, of Norfolk, Va., a grandson of Col. George Blow, of Tower Hill, Sussex County, Virginia. He received his preparatory education in Webster's Academy, in Norfolk, and later entered the Virginia Military Institute, from which he was graduated in 1877. After spending a year in teaching in the public schools of Norfolk, and another year in the office of the City Engineer of that city, Mr. Blow went to Leadville, Colo., in the autumn of 1879. In Leadville he became associated with his cousin, William Byrd Page, forming the firm of Page & Blow, which developed an extensive practice as mine surveyors. In connection with this work Mr. Blow obtained an unusually comprehensive knowledge of the mines of the new district, and he applied it to good advantage in studying the geology of the ore deposits, which at that time were not commonly understood, the famous report by S. F. Emmons not yet having been published. Mr. Blow's attainments in this respect, together with his recognized capacity as an engineer and his exhibition of administrative qualities, led to the invitation to him in 1884 to become general manager of the Silver Cord Combination Mining Co. in Leadville. Under Mr. Blow this company became very successful indeed. The conduct of its affairs was intensely interesting to him, not only in a commercial way, but also in a scientific, the company possessing ore deposits of complicated character, the unraveling of which was a delight to him. The results of his studies, not only in this mine, but also in the adjoining mines of Iron Hill, led to the preparation of an elaborate and scholarly paper that was published in the Transactions of the American Institute of Mining Engineers, which was immediately recognized as one of the most important contributions to the knowledge of the Leadville ore deposits.

During the latter part of his sojourn in Leadville, Mr. Blow laid out and constructed the famous Yak tunnel. He also became more and more engaged in general consulting work, in such capacity visiting many parts of the Western United States, Mexico and British Columbia, this professional employment extending itself greatly after he removed his headquarters from Leadville to Denver.

The reputation that Mr. Blow had gained by this time was very considerable, and it was quite in the order of things that in 1896 he should have been called to London, and thence sent to the Transvaal, South Africa, to undertake the management of the Sheba Gold Mining



ALBERT ALLMAND BLOW

Co. We should like to dwell upon the excellent work that he did during the three years that he was manager of the Sheba mines. He increased the mill to 200 stamps, so as to handle the lowest grade of ore; discovered new and extremely rich veins in adjoining claims of the company, and generally augmented both the yield of the mines and the dividends of the company, while improving the whole tone of the place, not only by means of better management, the introduction of a more capable staff, etc., but also through his marvelous ability in handling the Kafir labor.

In 1899 Mr. Blow resigned the management of the Sheba company and became consulting engineer for several important British syndicates operating in the Transvaal and other countries. However, the breaking out of the Boer War caused him to move his headquarters to London. He remained there about five years, making professional visits to Mexico, South America, Australia, New Zealand, Tasmania, and Canada.

In 1904 Mr. Blow returned to the United States and opened an office as consulting mining engineer in New York, continuing the same kind of work that he had previously been doing from London. In 1910 he became consulting mining engineer for the White Investing Co., which position he retained until 1912. In 1913 he retired from active practice, and went to Tennessee to engage in the development of the natural resources of the South. He formed the Southern Minerals Co., and

the Union Zinc Co. He divided his time between Knoxville and his country home "Belleville," in Gloucester County, Virginia, which he enjoyed greatly.

In 1885 Mr. Blow married Jennie Matteson Goodell, who survives him. She enjoys the distinction of having been decorated by Queen Victoria with the Lady of Grace Order of St. John for the active part she took (in conjunction with Lady Randolph Churchill) in raising funds for the purchase and equipment of the hospital ship "Maine" sent by Americans to Capetown for aid to the British wounded in the Boer War in 1899. Mr. Blow is also survived by two sons, George and Allmand, both of whom are graduates of Columbia and the School of Mines, after being graduated from the Virginia Military Institute. George took the mining degree, while Allmand took the metallurgical. George is now a major in the U. S. Army.

Mr. Blow was a member of the American Institute of Mining Engineers, and of the Institution of Mining and Metallurgy, besides other technical societies. He was a member of the Order of the Cincinnati. He received the honorary degree of Engineer of Mines from the Colorado School of Mines, and served as a trustee of that school during 10 years. He served also on the Board of Visitors of the Virginia Military Institute.

Albert Allmand Blow was an engineer of the type that has brought our profession into its high esteem. This is the type that sets the honor of the profession above everything else. The remembrance of his distinguished ability, of the high integrity that he maintained through his entire career, and of his sunny, genial disposition and warm-heartedness that made him many sincere friends wherever he went, will long remain with us.

Help Save America's Boys

THE Government needs at once a large number of heavy machine tools. There is no time to have them built. They must be supplied immediately by such engineering establishments as have them available now.

Most mining companies of any size have machine shops for the repair of their mining and metallurgical apparatus, and among the tools embraced in this equipment it is certain that there are some that can be and must be made available to the Government, in order that our troops in France may have the vitally essential support of heavy artillery.

Heavy guns must be made at the earliest possible moment. They cannot be made in the number so urgently needed unless the required machine tools are supplied immediately by engineering establishments from such shop equipment as is not in use on "essential" materials or is at least available for temporary use on Government work. Of course this means inconvenience, readjustment and possibly sacrifice. But big guns the men in France must have. Consider the significant figures supplied by the Machine Tool Section of the War Industries Board as to the necessity and urgency of this matter:

The loss of life in assaulting columns runs up to 40 and 60% when heavy artillery is not available to clear the way by shattering the enemy's defenses, making an inferno of the region and driving such men as remain into deep underground shelters.

The loss is only 3 to 5% when the advance has been prepared by heavy artillery fire that wipes out by means of high-explosive shells all enemy surface works and every living thing above ground in the area of their effective action.

The soldiers of the United States must have the greatest protection possible. The Government must have the machines with which to make this heavy artillery. It should not be necessary to commandeer these tools, and it is believed that the Government will not be forced so to do. Owners and users of the needed tools must supply them. Take stock of the tools in the machine shop. Some can probably be spared. Get them in condition for immediate shipment.

The machines which the War Industries Board announces are urgently needed are:

60 x 60 x 20-ft. planing machines.
48 x 48 x 20-ft. planing machines.
36 x 36 x 14-ft. planing machines.
Nos. 4 and 5 plain milling machines.
Nos. 4 and 5 vertical milling machines.
30-in. x 20-ft. engine lathes.
36-in. x 20-ft. engine lathes.
4- and 5-ft. radial drilling machines.
18 x 130-in. cylindrical grinding machines.
10-ft. vertical boring mills.
5-ft. vertical boring mills.
6-in. floor type, horizontal boring and milling machines.
4-in. floor type, horizontal boring and milling machines.

Thousands of machines of the type listed are now in the machine shops of this country. The Government needs them at once to make the heavy guns. Release as many as possible for ordnance work. They will be paid for at a fair price, and their return after the war can be arranged. The War Industries Board of the Council of National Defense desires the immediate coöperation of every owner of such tools as can be spared from work not now absolutely essential to national defense. Communicate directly with the board. No scalpers or speculators will be permitted to profit by the situation, but the coöperation of reputable dealers is welcome and they can assist greatly by informing the board at once where the needed machine tools may be found, and in putting them in condition of immediate availability.

Volunteer—not draft—service must be the Government's dependence in this urgent situation, and all possessing or controlling the needed machines should come forward at once. This is no time for counting the cost. Patriotism and duty call. Embrace this opportunity for service and sacrifice in order that the people of this nation shall be required to endure only the minimum of agony incident to our fight for liberty and humanity.

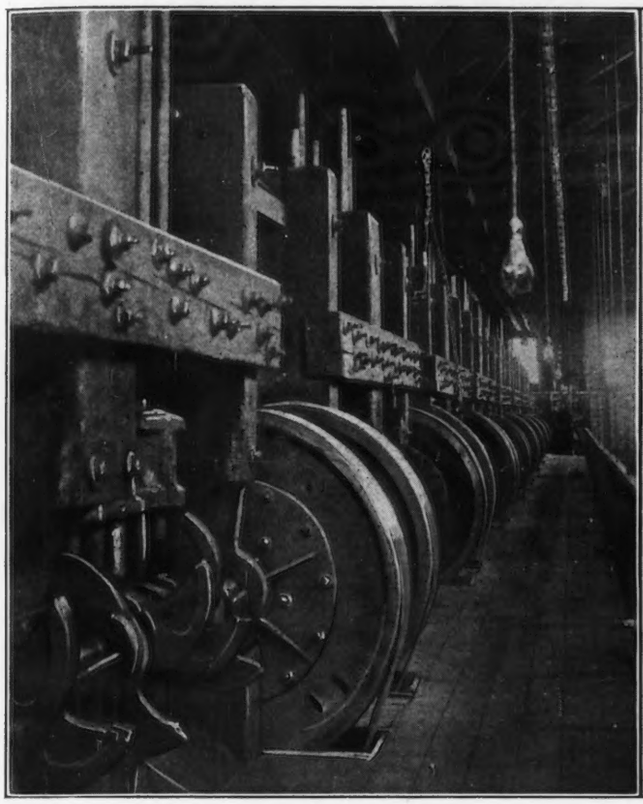
The opportunity for service is come. Decide at once which machine can be spared now and which in 30 days. This idle or seldom-used shop equipment will help to win the war. Wire or write to the Machine Tool Section, War Industries Board, Council of National Defense, Washington, D. C.

DO IT TODAY

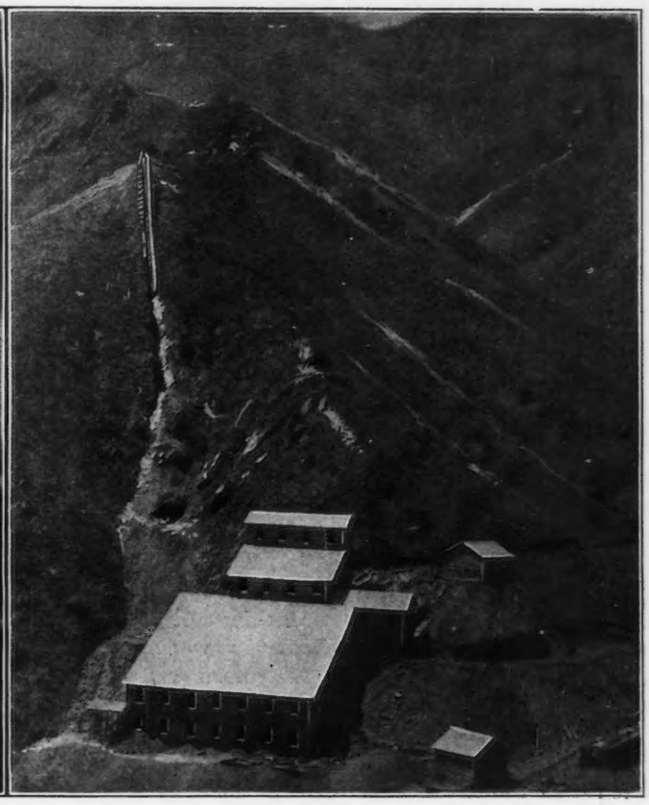
Oriental Consolidated Mining Co., Chosen

TARACOL 80-STAMP MILL, CONCENTRATOR AND CYANIDE PLANT OF THE ORIENTAL CONSOLIDATED, UNSAN

TABOWIE 80-STAMP MILL AND CONCENTRATOR OF ORIENTAL CONSOLIDATED MINING CO., UNSAN, CHOSEN

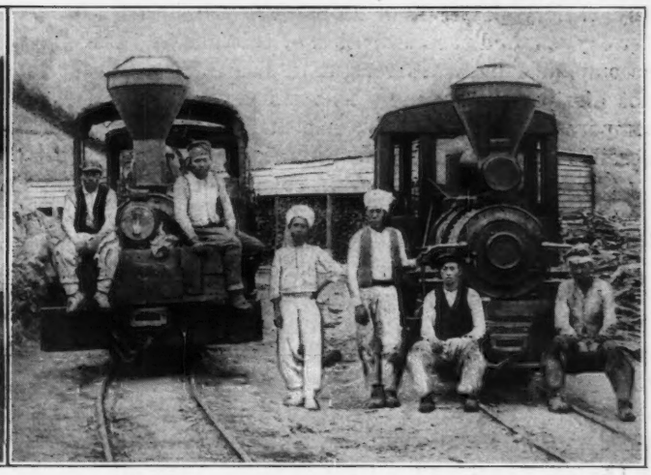


STAMPS AT TARACOL 80-STAMP MILL

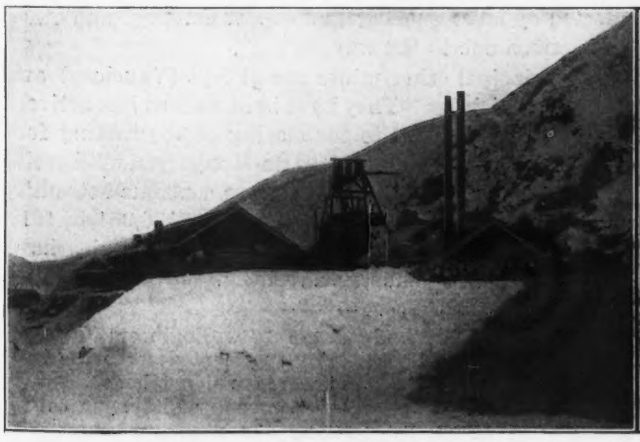


CANDLESTICK MILL OF ORIENTAL CONSOLIDATED

TRANSPORTING MINING SUPPLIES



RAILWAY USED TO HAUL CORDWOOD



TARACOL MINE, UNSAN, CHOSEN

TYPICAL MINING VILLAGE

Spontaneous Fires in Coal Stockpiles

The recent coal situation and the earlier predictions of coal shortages throughout the country have led to a concerted effort on the part of many of the mine operators to accumulate a greater supply of coal at their various plants than has been customary. The result has been an appreciable accumulation of coal stockpiles in the different districts. Recently there have been several instances of fires that have broken out in such stockpiles, requiring considerable time and money to get under control. Concerning the origin and control of such fires, a recent issue of *Coal Age* offers the following:

It would appear that such fires might come from one or the other of two causes—incendiarism or spontaneous heating. While it is doubtless true that destruction of its fuel reserve would be a quick method of at least embarrassing a railroad or an industrial coal consumer, yet it is believed that most of the stockpile fires that have developed recently have been due to spontaneous combustion. In order to escape detection in the early stages of such a fire, the incendiary would be constrained to work with extreme wariness. Coal stocks are usually guarded. Furthermore, a firebug would necessarily be compelled to work upon the exterior of the coal pile, or from the outside inward. Spontaneous heat on the other hand is invariably most intense in the interior of a pile, and it is well below the pile surface that firing starts from this cause.

As is well known, freshly mined bituminous coal of any variety possesses a more or less marked affinity for oxygen, and the absorption of this gas by the coal is accompanied by an increment of heat. If this heat is not dissipated as rapidly as it is generated, a rise in temperature ensues. This rise in temperature renders possible an increase in the rate of absorption of oxygen by the coal. Thus the more a coal heats the more rapidly may it heat. If the temperature rises beyond a certain critical point, serious results may follow.

The rise in temperature of stocked coal may be hindered and retarded by many circumstances. Water adhering to the surface and soaked into the structure of the material to a slight extent must be evaporated before any dangerous rise in temperature is possible. Consequently, the critical temperature is ordinarily about 180 deg. F., since at about this temperature the moisture in the coal pile dries out quite rapidly. Once the coal is dry it may heat speedily and soon attain a temperature where actual ignition takes place.

It was formerly considered that sulphur in the form of pyrite was the substance in coal that caused spontaneous ignition. Experiments would indicate, however, that this sulphur compound while doubtless to some extent aiding in the heating process is not entirely responsible for it. Many coals that do not contain pyrite in appreciable amounts will fire spontaneously if conditions conducive to such ignition are present.

The conditions under which coal may be stocked without danger of spontaneous ignition vary with the kind, size and condition of coal. Fine coal, since small particles spread more surface to the air in comparison to their weight than do large ones, is much more liable to heat than are lumps. Consequently, sized lump coal may be stocked with safety to a much greater depth than may slack or run-of-mine.

The percentage of voids in a coal pile also probably plays an important rôle in spontaneous heating. Of course, if there were no voids in a coal pile there would be no circulation of air, no oxygen would be absorbed and consequently no heating would develop. On the other hand, if the percentage of voids is large (probably 40 to 50 per cent. in unpacked sized lump), the circulation of air is free and whatever heat is generated is rapidly dissipated—that is, carried away by the air. Somewhere between these two extremes there is a condition where the heat generated by oxidation is not carried away with sufficient rapidity to prevent an appreciable rise in temperature. This heating effect is cumulative, since the coal oxidizes more rapidly at a high than at a low temperature.

No fixed and definite rules for safely stocking coal can be laid down. In general, however, the following considerations should be borne in mind:

Freshly mined or freshly broken coal heats more readily than does coal long mined or not freshly broken; consequently, a coal that does not break easily, or one that has undergone a long railroad haul, might be safely stocked to a greater depth than a freshly mined and friable coal of the same chemical composition.

Lump coal, especially sized lump, may be safely stocked to a greater depth than run-of-mine or slack.

Stocking coal under water is a sure and positive preventive of spontaneous combustion in the stockpile.

Experience would indicate that in outdoor storage run-of-mine coal of almost any variety may be stocked to a depth of 3 to 4 ft.; freshly mined or freshly crushed slack of almost any variety stocked to a depth of about 10 ft. is liable to heat, and some varieties thus treated are almost sure to fire if left undisturbed.

Decline of Bauxite and Ocher Mining in France

While definite data are lacking concerning the bauxite mines in the Var and Hérault Departments and the ocher mines in the Vaucluse Department, France, it is known that in both cases the output has been materially reduced, according to Consul General A. Gaulin, in *Commerce Reports* of Nov. 16, 1917. The average bauxite production in the Marseilles consular district from 1910 to 1913, inclusive, was slightly in excess of 242,000 metric tons. Total bauxite production in France during 1913 was 309,294 metric tons. This industry was affected by labor shortage, an export embargo and other restrictions due to the war.

The principal ocher mines are at Apt (Vaucluse) and immediate vicinity. They have been worked less actively than formerly, owing to the closing of the leading foreign markets—Germany, Austria-Hungary, and Russia. Shipments to the United States have continued steadily, amounting to $190,139 in 1916, against $136,951 in 1915 and $131,826 in 1914. Transportation difficulties have also affected this industry adversely.

Have You Subscribed to the 27th Engineers Comfort Fund? The men of the mining regiment deserve the best you can do for them. Kind words will not keep them in smokes and other comforts, but money will. Your check, to the order of the *Engineering and Mining Journal*, will express your attitude most forcibly.

Correspondence and Discussion

Is Gold Mining Necessary During the War?

To me the discussion of the advisability of continuing gold mining during the war is nothing short of astounding.

If there were gold mines in Germany, would they be operating at the present moment? Already our Government has asked us not to withdraw gold coin from the banks, and has instructed the banks not to pay it out.

If the war continues for a number of years, will we not be asked to turn all our gold into the Government?

MARK R. LAMB.

New York, Dec. 31, 1917.

In the *Journal* of Dec. 8, on the "Correspondence and Discussion" page, 1003, over the signature of J. Parke Channing, an article appeared entitled "Is Gold Mining Necessary During the War?" I beg to submit another side of this question, which has evidently been overlooked by Mr. Channing.

There are several undertakings in California which are the sole support of the communities in which they are operating, and it is certain that many other instances could be cited similar to the following, which may be considered, therefore, as representative:

Thirty years ago a mine employing upward of 500 men took fire, and was forced to cease operations. The town became nearly deserted as time went on, and, at the end of 24 years, the place was in a dilapidated state. The inhabitants, who had numbered 1000 or more, dwindled to less than fifty.

Six years ago an English company secured an option on this old, dilapidated and abandoned mine, and, after an expenditure of slightly under $1,000,000, the property was placed upon a self-supporting and dividend-paying basis. Since that time, and to Nov. 1, 1917, over $2,000,000 has been recovered from the treatment of ore uncovered in this mine. The cash put into the property and taken out of it is as follows:

Purchase and development	$967,140.00
Machinery, plant and mine supplies	636,550.74
Labor and salaries	820,001.00
Surplus over all charges for the 39 months of actual milling operations	691,302.00
Total	$3,114,993.74

There are now more than 200 men working for the company, and the town has grown to a population of over 600. There are more than 100 new buildings in the place, and everybody is prosperous and as happy as present conditions warrant. The surrounding district is dependent upon this and other nearby mines for a market for farm and timber products.

The monthly distribution for wages and salaries at this mine (which, it must be remembered, is expended locally) is $21,472, or an annual disbursement of $257,672. Other local expenditures include mine timber, $665; grinding pebbles (which are obtained locally instead of from foreign parts, as was the case before the war), $759; local merchants, $500; teamsters hauling supplies, $800; a total monthly expenditure, aside from payroll, of $2724—or an annual distribution through this source of $56,691; making a grand total disbursement in this district of $314,364 by this one company for local supplies, wages and salaries.

The total freight received at the mine amounts to 50 tons monthly, and the total outward freight per month from the mine is 135 tons. In the former case two cars would be the most required over the railway; and not over three cars outward for the latter. Therefore, it will be observed that the railway companies are not rendering the tremendous support to the mining communities that might be supposed. At the same time, it is important that the assistance heretofore given by the railways be continued, as it would not be possible for many of the mines to exist without the help of the railways, as the ore is too low grade to stand the expense of hauling by the old method of freight transport that was in vogue before the railways came into existence.

Consumption of foodstuffs in the town cannot represent more than two tons daily, or 60 tons per month. A part of this is obtained locally, and does not require railway transportation. I have allowed, however, two tons daily, which appears to be on the safe side.

When it is considered that $314,000 per annum is distributed in a small district of this kind, that the monthly railway accommodation is certainly not more than 100 tons (or the capacity of two freight cars), that the outward freight accommodation of 135 tons can be handled by three freight cars, and that this product is a concentrate containing a high percentage of sulphur, which is recovered and made into sulphuric acid, and in turn helps to manufacture explosives, the question appears to be so obviously in favor of continuing operations at the mines that it seems fruitless to continue further argument. However, additional information on this subject is pertinent and should be useful:

Homes have been built up in the mining country at considerable sacrifice, in many instances, to the heads of the families. Families have been brought up, and when war was declared, the eligible were drafted, and the mining industry today is being maintained by employees who have not been selected for the Army, and who know nothing about shipbuilding. Further than that, they would not stand much chance of securing employment on a manufacturing or shipbuilding job, as they are, in many cases, too old and, above all, know nothing whatever about such work. Their lives have been spent entirely in mining; they have built homes, reared families, and their all is bound up in the one vocation. If their only livelihood (mining) is taken from them—and it must be considered that the chance for making a living in the mine would be taken away, as out of the 12,000 miners employed in this state half of this

number are engaged in gold mining—it is easy to foresee that many people would be thrown upon charity.

The question as to whether gold is or is not necessary to help win the war has apparently been fully answered by the action of the Treasury Department, which has adopted drastic measures in the interest of maintaining and increasing the nation's gold reserves. If action such as suggested by Mr. Channing is seriously contemplated, this subject should be dealt with, and investigated by a Government committee consisting of representative men who know what the local conditions are, before a grave mistake is made in closing down an industry that has taken nearly three-quarters of a century to build up.

So far as supporting the base-metal mines is concerned, the gold mines of California have already contributed through agents who have visited the gold mines and have enticed men away by offers of better pay than the low-grade mines could afford. In addition, wages have already increased 20 to 30% and supplies from 10 to 280%; still, the gold mines struggle along.

Nothing has been said herein about the injustice to the investor by forcing a close-down of his mine. This side of the situation has many angles, so many, indeed, that it would require considerable space to discuss it thoroughly. But the necessity of protecting the owner of a mining property is so obvious as to require no elaboration.

Has it ever occurred to the opponents of gold mining that it has taken since 1848 to build up an industry in California alone that employs directly and indirectly 6000 or more men? Can it be supposed for a moment that this business, which is widely scattered and has taken 69 years to build up, can be abandoned at short notice without causing great dislocation of trade and great hardship to investors, employees, and those dependent upon it?

Those who are connected with this subject are fearful that some ill-advised regulation will be forced upon the industry, which will cause suffering to those thrown out of employment and an added burden to those who are fortunate in having employment outside of mining.

If closing down the gold mines would help win the war, then there is not an American in the United States who would not support such a proposal; but, as the true condition has been pointed out here, the question asked by Mr. Channing will be left unanswered.

ROBERT I. KERR,
Secretary Treasurer,
California Metal Producers' Association.

San Francisco, Calif., Dec. 27, 1917.

I cannot take seriously the talk about closing down the gold quartz mines of the country. On the other hand, experience has taught me that ignorant busybodies can cause a lot of trouble. The shutting down of the gold mines would benefit none but those operating other metal mines. They, of course, would have a greater number of skilled workmen to draw from, and possibly be able to cut wages. The closing of the gold mines would mean a monetary loss that no man can even estimate. Many deep mines would never be unwatered after having been shut down. Thousands of men, whose every dollar and many years of hard labor are invested in developing prospects, would be ruined.

It is to be regretted that our Government has never encouraged or aided the gold miner, though his ceaseless toil and perseverance have made possible the development of the greatest country of all. It has ever been the gold miner who has done the pioneering, and, were it not for the fruits of his labor, Americans would today be a race of humpbacked farmers, slaving for some powerful European nation.

The gold mines require but little outside labor. Besides, machinery companies probably have enough manufactured material on hand to supply them during the war. Practically all the ore from gold mines is treated at the mines. Consequently they are of no burden to the railroads. The explosives used by them for the period of a year would hardly make one good old-fashioned Fourth of July. So why pick on the gold mines?

There are many lines of business that are of far less importance to the country's welfare than gold mining. The automobile business stands out by itself. Every atom of material used in building an automobile could be used for war purposes. The plants and skilled mechanics could all be of service to the Government. The sales agents are a husky lot of young fellows and, if properly approached, could probably be induced to work. In a pinch, we might be able to get along without old John Barleycorn, and after those handling it and using it have been dried out, they also might be of assistance. And possibly we might be able to wiggle along if the real estate brokers layed off for a few shifts.

There is no limit to the non-essential lines of occupation that could be dispensed with. So I say, Why pick on the gold mines? E. J. BARNES.

French Gulch, Calif., Dec. 20, 1917.

Deceptive Similarity in Knots

A short article under the above heading appeared on page 885 of the Nov. 17 issue of the *Journal*. It describes in detail the somewhat unusual knot known as the "thief," and states that it is presumably so called because it looks so much like the square knot, so well known and reliable.

I had never before seen this knot described in print, but several years ago it was explained to me by a man who spent his boyhood largely among the fishermen of Cape Cod. He called it the "sailor's bread-bag knot" and said that its principal use was for tying up the bag or sack containing a sailor's private property and commonly known as his "bread-bag." Its particular value in this connection was due to the fact that it looked almost exactly like the well-known square or reef knot, and any sailor who had not previously been acquainted with this knot would naturally think that the bag was tied up with an ordinary square knot, and after opening it would again tie it with a square knot. This, of course, assumes that he was getting into something that did not belong to him. The fact that the bag was tied up with a square knot would at once betray to its proper owner the fact that it had been tampered with. It seems extremely probable that this use of the knot is what gave it its title of the "thief," and that the explanation may be of interest to the *Journal's* readers who might have occasion to use it. LEE A. KNIGHT.

Claremont, N. H., Nov. 23, 1917.

Mining Dividends in 1917

THE tables which follow show the dividends paid in 1916, 1917 and to date by the principal mining, metallurgical and holding companies of America that have paid dividends since 1912, except those which do not make public reports.

As most mines are commercial producers of two or more metals, no attempt is made to classify them as copper producers, lead producers, etc. Also it is difficult to make a precise geographical distribution, and United States companies, such as the American Smelting and Refining, which have properties in two countries, are listed under United States.

Toward the end of 1917 many companies found it necessary to reduce or discontinue their payments, owing to labor conditions, increased expenses, war taxes, etc., but in spite of difficulties, the total paid in 1917 by 134 United States mining and metallurgical companies was $242,158,588, an increase over 1916, when $237,508,893 was disbursed by companies.

Dividends paid by mines in Canada, Mexico, etc., showed a decrease, 1917 payments being $22,477,657 against $24,180,894 in 1916. Holding and miscellaneous companies paid $11,020,185 in 1917 and $23,271,660 in the preceding year.

DIVIDENDS OF MINING AND METALLURGICAL COMPANIES IN THE UNITED STATES

COMPANY NAME	SITUATION	SHARES Issued	Par Value	DIVIDENDS PAID 1916 Per Share	1916 Total	1917 Per Share	1917 Total	Total To Date	Latest Date	Latest Amount
Ahmeek, c	Mich.	200,000	$25	$12.50	$2,500,000	$16.00	$3,200,000	$9,250,000	Oct. '17	$4.00
Alaska Goldfields	Alas.	250,000	5	.....	.....	.10	25,000	428,250	Jan. '17	.10
Alaska Mexican, g	Alas.	180,000	5	.....	.....	.....	.....	3,507,381	Nov. '15	.10
Alaska Treadwell, g	Alas.	200,000	25	1.25	250,000	.....	.....	15,785,000	May '16	.50
Alaska United, g	Alas.	180,200	5	.30	54,060	.....	.....	2,045,270	Feb. '16	.30
Allouez, c	Mich.	100,000	25	7.00	700,000	12.00	1,200,000	2,000,000	Oct. '17	3.00
Am. Sm. & Ref., com	U.S.-Mex.	609,930	100	6.00	3,140,576	7.00	4,269,650	36,401,703	Dec. '17	1.50
Am. Sm. & Ref., pf	U.S.-Mex.	500,000	100	7.00	3,500,000	7.00	3,500,000	61,795,386	Dec. '17	1.75
Am. Smelters, pf. A	U. S.	116,838	100	6.00	993,258	6.00	934,492	12,668,027	Oct. '17	1.50
Am. Smelters, pf. B	U. S.	41,792	100	5.00	1,500,000	5.00	854,480	17,864,480	Oct. '17	1.25
Am. Zinc, Lead & Sm	U. S.	193,120	25	( )	.....	2.00	386,240	1,495,060	May '17	1.00
Am. Zinc, Lead & Sm., pfd	U. S.	96,560	25	3.00	256,649	6.00	579,360	836,009	Nov. '17	1.50
Anaconda, c	Mont.	2,331,250	50	7.00	16,318,750	8.50	19,815,625	137,707,500	Nov. '17	2.00
Argonaut, g	Calif.	200,000	5	.40	80,000	.35	70,000	1,850,000	Dec. '17	.05
Arizona Commercial, c	Ariz.	265,000	5	.50	132,500	1.60	556,500	689,000	Oct. '17	.50
Arizona Copper, pf. (*b*)	Ariz.	.....	.....	.....	119,221	.....	119,221	2,367,509	Nov. '17	.....
Arizona Copper, com	Ariz.	1,519,896	1.20	.66	1,008,820	1.14	1,754,339	20,231,826	July '17	.54
Arizona United, c	Ariz.	2,500,000	1	.01	25,000	.03	75,000	100,000	July '17	.01
Atolia, tung	Calif.	100,000	1	.....	2,705,000	13.00	1,300,000	4,554,500	Dec. '17	1.00
Baltic, c	Mich.	100,000	25	.....	.....	.....	.....	7,950,000	Dec. '13	2.00
Barnes-King, g	Mont.	400,000	5	.15	60,000	.10	40,000	100,000	Nov. '17	.10
Big Creek Leasing, l. s	Ida.	5,000	10	.....	.....	2.00	10,000	10,000	Dec. '17	.50
Big Four Explor	Utah	400,000	1	.10	40,000	.....	.....	50,000	June '16	.05
Bingham Mines, c	Utah	150,000	10	.....	.....	1.25	187,500	187,500	Oct. '17	.50
Bingham-New Haven, c	Utah	228,690	5	(*e*)	.....	.....	.....	960,494	Dec. '15	.20
Boss, g	Nev.	408,500	1	.02	8,170	.08	32,680	81,700	Dec. '17	.02
Brunswick, g	Calif.	395,287	1	.....	.....	.....	.....	203,315	Sept. '15	.06
Bunker Hill Con., g	Calif.	200,000	1	.22½	45,000	.....	.....	931,000	Sept. '16	.02½
Bunker Hill & Sull., l. s	Ida.	327,000	10	5.25	1,716,750	6.25	2,043,750	20,533,500	Dec. '17	.50
Butte-Alex. Scott, c	Mont.	79,311	10	10.65(*d*)	844,662	.....	.....	1,054,019	Apr. '16	10.50
Butte-Bullwhacker, c	Mont.	1,000,000	1	.....	.....	.02½	25,000	25,000	Oct. '17	.01
Butte & Superior, z	Mont.	290,197	10	34.00	9,490,430	6.65	1,929,810	16,940,264	Sept. '17	1.25
Caledonia, l. s	Ida.	2,605,000	1	.36	937,800	.36	937,800	2,758,381	Dec. '17	.03
Calumet & Arizona, c	Ariz.	642,480	10	9.00	5,777,296	11.00	7,067,082	35,994,349	Dec. '17	2.00
Calumet & Hecla, o	Mich.	100,000	25	75.00	7,500,000	85.00	8,500,000	145,250,000	Dec. '17	10.00
Camp Bird, g. s	Colo.	1,100,051	4.86	.....	.....	.....	.....	9,185,498	Nov. '15	.24
Camp Bird, pfd	Colo.	649,625	4.86	.36	221,002	.36	221,002	1,387,154	July '17	.18
Cardiff, l. s	Utah	500,000	1	.75	375,000	.25	125,000	625,000	Aug. '17	.25
Centennial, c	Mich.	90,000	25	1.00	90,000	1.00	90,000	180,000	Mar. '17	1.00
Centennial-Eur., l.s.g.c	Utah	100,000	5	1.00	100,000	.....	.....	4,150,000	Apr. '16	1.00
Center Creek, l. z	Mo.	100,000	10	.60	60,000	.35	35,000	650,000	Oct. '17	.05
Cerro Gordo, z.l.s	Calif.	1,000,000	1	.02½	24,375	.22½	225,000	249,375	Oct. '17	.05
Champion, c	Mich.	100,000	25	.....	6,014,541	44.80	4,480,000	21,994,541	Oct. '17	6.40
Chief Con., s.g.l	Utah	884,223	1	.20	176,481	.35	309,435	831,953	Nov. '17	.10
Chino, c	N. M.	869,980	5	8.25	7,177,335	9.90	8,612,802	27,488,132	Dec. '17	2.00
Cliff, g	Alas.	100,000	1	.....	.....	.....	.....	210,000	Dec. '13	.05
Cliff, s.l	Utah	300,000	1	.....	.....	.....	.....	90,000	Jan. '13	.10
Coahuila, l.z	Mo.	300,000	1	.25	75,000	.20	60,000	150,000	Nov. '17	.05
Colo. Gold Dredging	Colo.	100,000	10	1.00	100,000	.....	.....	775,000(*e*)	Feb. '16	1.00
Commercial	Ore.	1,651,000	1	.05	83,050	.05	82,550	448,900	Nov. '17	.00½
Cons. Ariz. Smelting, c	Ariz.	1,663,000	5	.....	.....	.10	166,300	166,300	Nov. '17	.10
Con. Interstate-Callahan, z	Ida.	464,990	10	6.00	2,789,940	2.00	929,980	6,277,365	June '17	1.00
Con. Mercur, g	Utah	1,000,000	1	.....	.....	.....	.....	3,445,313	July '13	.03
Continental, z.l	Mo.	22,000	25	1.00	22,000	1.50	33,000	616,000(*f*)	Oct. '17	1.00
Copper Range, c	Mich.	394,399	25	10.00	3,941,648	10.00	3,943,912	23,054,310	Dec. '17	2.50
Cresson Cons., g	Colo.	1,220,000	1	1.35	1,647,000	1.20	1,464,000	5,807,162	Dec. '17	.10
Daly	Utah	150,000	20	.....	.....	.30	45,000	2,975,000	Oct. '17	.10
Daly Judge, s.l	Utah	300,000	1	(*g*)	.....	.....	.....	1,155,000	Dec. '15	.35
Daly West, s.l	Utah	180,000	20	.....	.....	.....	.....	6,606,000	Jan. '13	.15
Derry Ranch, g	Colo.	100,000	100	75.00	75,000	25.00	25,000	100,000	Oct. '17	5.00
Dr. Jack Pot, g	Colo.	2,843,342	.02½	.01	28,443	.01	28,443	141,698	Jan. '17	.01
Dragon Con	Utah	1,875,000	1	.....	.....	.04	75,000	75,000	Oct. '17	.01
Duluth & Utah Dev., l.s	Utah	50,000	.20	.....	.....	.....	.....	10,000	Mar. '15	.04
Dunkin, g	Colo.	200,000	1	.12½	25,000	.....	.....	55,000	Aug. '16	.07½
Eagle & Blue Bell, g.s.l	Utah	893,146	1	.10	89,315	.40	357,258	893,146	Aug. '17	.10
East Butte, c	Mont.	420,700	10	.....	.....	2.00	831,100	831,700	Dec. '17	1.00
Elkton Con., g	Colo.	2,500,000	1	.....	.....	.....	.....	3,579,465	May '15	.02
El Paso, g	Colo.	490,000	5	.....	.....	.....	.....	1,707,545	Feb. '14	.10
Empire Copper	Utah	1,000,000	1	.17	170,000	.20	200,000	780,000	Oct. '17	.05
Engels Cop	Calif.	1,339,451	1	.01½	20,092	.....	.....	20,092	July '16	.01½
Ernestine, g.s. (*h*)	N. M.	300,000	5	.....	.....	.....	.....	150,000	July '15	.10
Eastern Talc	Vt.	69,696	10	.....	24,798	.....	41,220	66,018	Dec. '17	.15
Electric Point, l	Wash.	793,750	1	.....	.....	.20	166,687	166,687	Sept. '17	.15
Elko Prince, g.s	Nev.	1,108,566	1	.....	.....	.03½	38,800	38,800	Oct. '17	.03½
Farncomb Hill Gold Dredg	Colo.	300,000	1.00	.....	.....	.16	48,000	48,000	Oct. '17	.07
Federal M. & Sm., pf	Ida.	119,861	100	4.25	509,409	7.00	839,027	13,925,331	Dec. '17	1.75
First Nat. Cop	Calif.	600,000	5	.25	150,000	.40	240,000	390,000	Aug. '17	.40
Fremont Con., g	Calif.	200,000	2.50	.....	.....	.....	.....	254,000	Oct. '14	.02
Gemini, g.s	Utah	5,000	100	16.00	80,000	5.00	25,000	2,455,000	Mar. '17	5.00
Gethin-LeRoy, l.s	Utah	750,000	1	.....	.....	.....	.....	7,500	Nov. '13	.01
Golconda, g	Ariz.	850,000	1	.....	.....	.....	.....	170,000	Dec. '15	.10
Gold Chain, g	Utah	1,000,000	.....	.....	.....	.....	.....	130,000	May '13	.03
Gold King, g	Colo.	1,000,000	1	.....	.....	.....	.....	1,417,319	Nov. '16	.01
Golden Cycle, g	Colo.	1,500,000	1	.24	360,000	.36	520,000	8,178,500	Dec. '17	.03
Goldfield Con., g	Nev.	3,559,148	10	.....	.....	.....	.....	28,999,832	Oct. '15	.10

DIVIDENDS OF MINING AND METALLURGICAL COMPANIES IN THE UNITED STATES—(Continued)

COMPANY NAME	SITUATION	SHARES Issued	SHARES Par Value	DIVIDENDS PAID 1916 Per Share	1916 Total	1917 Per Share	1917 Total	Total To Date	Latest Date	Latest Amount
Good Springs Anchor, l.z	Nev.	550,000	1	.08	44,000	.07	83,500	169,285	Aug. '17	.01
Grand Central, g	Utah	500,000	1	.08	40,000	.16	80,000	1,753,250	Dec. '17	.04
Grand Gulch	Utah	239,845	.10	.12	28,782	.15	35,977	67,157	Dec. '17	.03
Granite, g	Alas.	430,000	1	.04	17,200	.....	.....	17,200	May '16	.02
Granite, g	Colo.	1,650,000	1	.....	.....	.03	49,500	336,000	Nov. '17	.01
Hamburg, g.s.l	Nev.	1,000	..	.....	.....	.02	16,000	16,000	Apr. '17	.01
Hazel, g	Calif.	900,000	..	.....	.....	.....	.....	971,000	Dec. '13	.01
Hecla, l.s	Ida.	1,000,000	.25	1.55	1,550,000	1.60	1,600,000	6,905,000	Dec. '17	.05
Homestake, g	S. D.	251,160	..	8.80	2,210,208	8.80	2,210,208	43,320,324	Dec. '17	1.65
Horn Silver Min., s.c.z.l	Utah	400,000	.5	.10	40,000	.....	.....	5,682,000	July '16	.05
Horn Silver Mines (i)	Utah	400,000	1	.05	20,000	.10	40,000	60,000	July '17	.05
Inspiration, c	Ariz.	1,181,967	20	5.25	6,184,117	8.25	9,751,228	15,935,345	Oct. '17	2.00
Inter'l Nickel, com	U. S.-Can.	1,673,384	25	10.00	10,458,650	5.75	9,621,958	45,583,448	Dec. '17	1.00
Intern'l Nickel, pf	U. S.-Can.	89,126	100	6.00	534,756	6.00	534,756	6,416,958	Nov. '17	1.50
Iowa, g.s.l	Colo.	1,666,667	1	.01	16,667	.03	50,000	336,833	July '17	.01½
Iowa-Tiger, g.s.l	Colo.	3,000	1	.....	.....	.....	.....	25,179	Dec. '15	1.00
Iron Blossom, s.l.g	Utah	1,000,000	.10	.35	350,000	.25	250,000	3,000,000	Oct. '17	.05
Iron Cap, c	Ariz.	144,810	.10	.20	20,459	.....	287,620	308,079	Dec. '17	.50
Iron Cap, pfd., c	Ariz.	(o)	.....	.....	30,538	.35	962	36,389	July '17	.35
Iron Silver, s.l.g	Colo.	500,000	20	.20	100,000	.20	100,000	5,250,000	Dec. '17	.10
Isabella Mines, g.s	Colo.	2,528,331	1	.01	25,283	.....	.....	742,500	Dec. '16	.01
Isle Royale, c	Mich.	150,000	25	3.00	450,000	6.00	900,000	1,500,000	Oct. '17	1.00
Jamison, g	Calif.	390,000	10	.....	.....	.....	.....	386,100	Dec. '15	.01
Jerry Johnson, g	Colo.	2,500,000	.10	.....	.....	.....	.....	187,500	Nov. '14	.00½
Jim Butler-Tonopah, g.s	Nev.	1,718,021	1	.20	343,604	.20	343,604	859,010	Aug. '17	.10
Joplin Ore & Spelter	Mo.	2,000,000	1	.15¾	63,000	.....	.....	63,000	July '16	.04½
Judge Min. & Sm.(m)	Utah	480,000	1	1.00	435,000	1.00	480,000	2,070,000	Dec. '17	.25
Jumbo Ext., g.s	Nev.	1,550,000	1	.12½	193,750	.....	.....	687,158	June '16	.05
Kendall, g	Mont.	500,000	5	.10	50,000	.....	.....	(f) 1,555,000	Apr. '16	.10
Kennecott Copper, c	.....	2,786,679	.....	5.50	15,320,283	5.70	15,887,369	31,207,652	Dec. '17	1.00
Kennecott Mines, c	Alas.	250,000	10	(k)	.....	(k)	.....	5,000,000	Jan. '14	4.00
Klar Piquette, z.l	Wis.	20,000	1	.....	.....	.....	.....	259,000	Apr. '13	.50
Knob Hill, g	Wash.	993,834	1	.....	.....	.01½	13,907	99,815	July '17	.00½
Lake View, z	Utah	500,000	1	.....	65,000	.....	.....	114,500	June '16	.01
Liberty Bell, g	Colo.	133,551	5	.....	240,392	.....	200,327	2,193,513	Sept. '17	.03
Linden, z	Wis.	1,020	10	.....	.....	.....	.....	11,220	Dec. '15	3.00
Little Bell, l.s	Utah	300,000	1	.05	15,000	.....	.....	90,000	Apr. '16	.05
Loon Lake, c	Wash.	1,460,000	.25	.....	.....	.03	43,352	43,352	Sept. '17	.01
Lost Packer, c	Ida.	150,000	5	.....	.....	.....	.....	37,500	Oct. '13	.25
Lower Mammoth, g.s.c	Utah	1,000,000	1	.....	.....	.....	.....	67,000	Dec. '15	.01
Magma, c	Ariz.	240,000	5	2.00	480,000	2.10	504,000	1,224,000	Dec. '17	.50
Mammoth, g.s.c	Utah	400,000	.10	.25	100,000	1.00	400,000	2,820,000	Nov. '17	.10
Mary McKinney, g	Colo.	1,309,252	1	.01	13,092	.....	.....	1,182,398	Oct. '16	.01
Mary Murphy, g	Colo.	370,000	5	.07	25,067	.....	.....	93,106	May '16	.07
Mass Con., c	Mich.	97,317	25	2.00	194,634	3.00	291,951	486,585	Aug. '17	1.00
May Day, g.s.l	Utah	800,000	.25	.07	56,000	.....	.....	300,000	Dec. '16	.02
Mexican, s	Nev.	201,600	1	.....	.....	.....	.....	171,360	Nov. '14	.75
Miami, c	Ariz.	747,113	5	5.75	4,295,905	8.75	6,724,020	16,519,803	Nov. '17	1.50
Mogollon Mines, g.s	N. M.	355,682	5	.....	.....	.....	.....	53,352	Oct. '15	.05
Mohawk, c	Mich.	100,000	25	17.00	1,700,000	20.50	2,050,000	7,625,000	Aug. '17	10.50
Moscow M. & M., g.s.c.z	Utah	900,000	1	.....	.....	.04½	40,000	107,480	Aug. '17	.02
National Zinc and Lead, l.z	Mo.	500,000	1	.33	165,000	.04	20,000	210,000	May '17	.02
New Jersey Zinc	U. S.	350,000	100	76.00	26,600,000	42.00	14,700,000	.....	Nov. '17	4.00
Nevada Con., c	Nev.	1,999,457	5	3.75	7,497,963	4.15	8,297,747	35,771,869	Dec. '17	1.00
Nevada Douglas, c	Nev.	1,000,000	5	.....	.....	.....	.....	125,000	Feb. '13	.12½
Nevada Packard, g	Nev.	1,164,700	1	.05	58,244	.....	.....	58,244	Dec. '16	.05
Nevada Wonder, g.s.	Nev.	1,408,240	1	.20	281,680	.20	281,680	1,166,887	Nov. '17	.10
New Idria, q	Calif.	100,000	5	4.00	400,000	3.00	300,000	2,530,000	Dec. '17	.50
North Butte, c	Mont.	430,000	15	2.50	1,075,000	2.50	1,075,000	14,227,000	Oct. '17	.25
North Star, g	Calif.	250,000	10	1.20	300,000	1.00	250,000	5,337,040	Dec. '17	.60
Oaks Co., pfd	N. M.	1,690	10	.10	169	.37½	465	634	Apr. '17	.17½
Old Dominion Co., c	Ariz.	297,071	25	(r)	(r)	8.00	2,376,210	13,216,924(q)	Dec. '17	1.00
Old Dominion M. & Sm., c (p)	Ariz.	162,000	25	12.00	1,944,000	(p)	.....	8,424,000	Dec. '16	3.50
Opohongo, g.s.l	Utah	898,978	.25	.....	.....	.....	.....	80,907	Jan. '13	.02
Optimo, z	Wis.	545	100	.....	.....	.....	.....	43,960	Sept. '15	10.00
Oroville Dredging, g	Calif.	686,538	4.86	.48	329,540	.48	329,540	2,436,765	Dec. '17	.12
Osceola, c	Mich.	96,150	25	16.00	1,538,400	20.00	1,923,000	16,410,275	Oct. '17	2.00
Pacific Gold	Utah	400,000	.10	.02	8,000	.....	.....	8,000	Nov. '16	.01
Pacific Mines	Calif.	642,000	1	.07	44,940	.....	.....	276,060	Dec. '16	.01
Parrot, c	Mont.	229,850	10	.....	.....	.....	.....	7,871,839	July '15	1.63
Phelps Dodge	U. S.	450,000	100	32.50	14,625,000	32.00	14,400,000	74,696,000	Dec. '17	10.00
Pittsburgh-Idaho, l	Ida.	817,692	1	.05½	44,928	.08	65,524	363,359	Apr. '17	.03
Pittsburg-Silver Peak, g	Nev.	2,790,000	1	.....	.....	.....	.....	771,200	July '14	.02
Plymouth, g	Calif.	240,000	4.86	.72	172,800	.48	117,040	462,640	Aug. '17	.24
Portland, g	Colo.	3,000,000	1	.14	420,000	.12	360,000	10,957,080	Oct. '17	.03
Prince Con., l.s	Utah	1,000,000	2	.25	250,000	.20	200,000	575,000	Nov. '17	.02½
Quincy	Mich.	110,000	25	16.00	1,760,000	18.00	1,980,000	25,517,500	Dec. '17	3.00
Ray Con., c	Ariz.	1,577,179	10	2.75	4,337,955	4.20	6,624,152	15,555,252	Dec. '17	1.00
Reorg. Booth, g	Nev.	1,000,000	1	.50	500,000	.....	.....	500,000	July '16	.10
Rescue Eula, g.s	Nev.	1,428,000	1	.....	.....	.02½	35,700	35,700	June '17	.02½
Round Mountain, g	Nev.	1,266,591	1	.....	.....	.....	.....	363,965	Aug. '13	.04
Rico-Wellington, l.z.c	Colo.	1,000,000	.10	.....	.....	.....	39,600	39,600	July '17	.....
St. Joseph, l	Mo.	1,409,466	10	2.50	3,523,665	3.50	4,933,124	18,724,684	Dec. '17	.75
Seven Tr. Coalition, g	Nev.	1,443,077	1	.02½	36,077	.....	.....	252,572	Apr. '16	.02½
Shannon, c	Ariz.	300,000	10	.50	150,000	1.25	525,000	1,425,000	Nov. '17	.50
Shattuck Arizona, c	Ariz.	350,000	10	4.75	1,662,500	5.00	1,750,000	6,387,500	Oct. '17	1.25
Silver King Coalition, l.s	Utah	1,250,000	5	.60	750,000	.60	750,000	15,085,885	Oct. '17	.15
Silver King Con., l.s	Utah	700,000	1	.45	294,562	.55	383,287	1,492,705	Dec. '17	.10
Skidoo, g	Calif.	1,000,000	5	.....	.....	.....	.....	365,000	Oct. '14	.01
Snowstorm, c.g	Ida.	1,500,000	1	.....	.....	.....	.....	1,192,103	Oct. '13	.00½
Socorro, g	N. M.	377,342	5	.30	113,190	.....	.....	252,666	Oct. '16	.05
South Hecla	Ida.	263,000	1	.15	39,438	.....	.....	39,438	Aug. '16	.15
Standard Con., g.s	Calif.	178,394	10	.....	.....	.....	.....	5,274,207	Nov. '13	.25
Stewart, s.l	Ida.	1,238,262	1	.....	.....	.....	.....	2,012,314	Dec. '15	.05
Stratton's Ind., g	Colo.	1,000,000	.30	.16	162,000	.....	.....	.....	Jan. '16	.15
Success, z	Ida.	1,500,000	1	.22	330,000	.....	.....	1,125,000	July '16	.03
Superior & Pitts, c	Ariz.	1,499,792	10	.....	.....	.....	.....	10,318,569	Dec. '15	.38
Superior, c	Mich.	100,000	25	1.00	100,000	1.00	100,000	200,000	Apr. '17	1.00
Tamarack & Custer	Ida.	1,776,288	1	.04	71,051	.06	124,340	195,391	Nov. '17	.03
Tennessee, c	Tenn.	200,000	25	1.50	300,000	.....	.....	5,206,250	Apr. '16	.75
Tightner, g	Calif.	100	1,000	.....	.....	.....	.....	160,000	Jan. '14	500.00
Tintic Standard, l.s	Utah	1,167,500	.01	.....	.....	.07	81,725	81,725	Dec. '17	.03
Tom Reed, g	Ariz.	909,555	1	.....	.....	.....	.....	2,528,648	Oct. '15	.01
Tomboy, g.s	Colo.	310,000	4.86	.24	150,660	.24	150,660	4,088,475	Dec. '17	.12
Tonopah-Belmont, s.g	Nev.	1,500,000	1	.50	750,016	.50	750,016	9,143,050	Oct. '17	.12½
Tonopah Ext., g.s	Nev.	1,282,801	1	.47½	604,524	.25	320,700	1,912,420	Apr. '17	.10
Tonopah of Nev	Nev.	1,000,000	1	.60	600,000	.55	550,000	14,150,000	Oct. '17	.15
Trimountain, c	Mich.	100,000	25	.....	.....	.....	.....	1,450,000	Dec. '13	2.00
Tuolumne, c	Mont.	800,000	1	.....	.....	.....	.....	520,000	May '13	.10
United (Crip Ck.) g	Colo.	4,000,000	.....	.01	40,000	.01	40,000	520,385	Dec. '17	.01
United Copper	Wash.	1,000,000	1	.01	10,000	.10	100,000	150,000	Oct. '17	.01
United Eastern, g	Ariz.	1,363,000	1	.....	.....	.30	408,900	408,900	Dec. '17	.05
United Globe, c	Ariz.	23,000	100	73.00	1,679,000	.....	.....	4,255,000	Dec. '16	22.00

DIVIDENDS OF MINING AND METALLURGICAL COMPANIES IN THE UNITED STATES—(Continued)

COMPANY NAME	SITUATION	SHARES Issued	SHARES Par Value	DIVIDENDS PAID 1916 Per Share	1916 Total	1917 Per Share	1917 Total	Total To Date	Latest Date	Latest Amount
U. S. Sm., Ref. & Min.	U. S.-Mex.	351,115	50	4.00	1,316,681	5.00	1,755,575	9,434,600	Oct. '17	1.25
U. S. Sm., Ref. & Min., pfd.	U. S.-Mex.	486,350	50	3.50	1,702,225	3.50	1,702,225	19,774,587	Oct. '17	.87½
United Verde, c.	Ariz.	300,000	10	13.50	4,050,000	17.50	5,625,000	46,072,000	Dec. '17	1.50
United Verde Ext., c.	Ariz.	1,050,000	.50	1.00	1,050,000	2.85	2,992,500	4,042,500	Nov. '17	.75
Utah Apex, c.	Utah	528,200	5	.75	396,150	.75	396,150	858,325	Oct. '17	.50
Utah Copper, c.	Utah	1,624,490	10	12.00	19,493,880	14.50	23,555,105	75,770,882	Dec. '17	3.50
Utah Con., c.	Utah	300,000	5	3.75	1,125,000	3.50	1,050,000	11,325,000	Dec. '17	.50
Utah Metal & Tunnel	Utah	691,588	1	.50	342,473	.80	553,262	895,734	Dec. '17	.30
Vindicator Con., g.	Colo.	1,500,000	1	.18	270,000	.12	180,000	3,712,500	Oct. '17	.03
Warrior Copper,pfd.	Ariz.	68,000	10	.....	.....	.70	47,600	47,600	Dec. '17	.70
Wasp No. 2, g.	S. D.	500,000	1	.20	100,000	.03	15,000	664,466	Apr. '17	.03
Wellington, g.	Colo.	10,000,000	1	.06	600,000	.40	400,000	1,650,000	Oct. '17	.10
West End Con., s.	Nev.	1,788,486	1	.05	89,424	.05	89,424	715,394	May '17	.05
White Pine, pfd., c.	Mich.	24,000	25	.....	.....	.....	126,051	126,051	Apr. '17	.....
Wilbert, l.s.	Utah	1,000,000	1	.04	40,000	.05	50,000	100,000	Nov. '17	.01
Wolverine & Ariz., c.	Ariz.	118,575	15	.....	.....	.....	.....	53,422	Dec. '15	.20
Wolverine, c.	Mich.	60,000	25	12.00	720,000	13.50	810,000	9,930,000	Oct. '17	6.00
Yak, s.l.	Colo.	1,000,000	1	.76	760,000	.71	710,000	3,477,685	Sept. '17	.07
Yankee Con. s.l.g.	Utah	1,000,000	1	.....	.....	.....	.....	167,500	Jan. '13	.01
Yellow Aster, g.	Calif.	100,000	10	.38	38,000	.35	35,000	1,245,789	July '17	.05
Yellow Pine, z.l.s.	Nev.	1,000,000	1	.80	800,000	.36	360,000	2,053,008	Dec. '17	.04
Yosemite, g.	Calif.	24,000	10	.....	.....	.....	.....	125,893	Dec. '14	.02
Yukon Gold, g.	Alas.	3,500,000	5	.30	1,050,000	.30	1,050,000	9,683,110	Dec. '17	.07½
Totals		.....	.....	.....	237,508,893	.....	232,158,588	1,510,539,048	.....	.....
HOLDING AND MISCELLANEOUS COMPANIES										
Amalgamated, c.	Mont.	1,538,879	$100	.....	.....	.....	.....	$103,444,983	Aug. '15	$3.77
California Expl.	.....	231,617	2.40	$0.24	$56,278	$0.24	$56,278	140,695	Oct. '17	.12
Eagle-Picher Lead, pf.	U. S.	10,000	100	3.00	30,000	6.00	60,000	90,000	Oct. '17	1.50
General Development	U. S.	120,000	25	5.75	690,000	7.00	840,000	4,523,917	Dec. '17	1.00
Guggenheim Expl.	U. S.	833,732	25	12.85 (*l*)	10,613,456(*l*)	.....	.....	34,036,783	Apr. '16	11.85
Lackawanna Steel, com.	N. Y.	350,975	100	.....	2,099,443	.....	4,211,673	6,658,395	Dec. '17	5.00
National Lead, com.	N. Y.	206,554	100	4.00	826,216	5.00	1,032,770	10,791,332	Dec. '17	1.00
National Lead, pf.	N. Y.	243,676	100	7.00	1,705,732	7.00	1,705,732	34,764,716	Dec. '17	1.75
Old Dominion (holding) (*q*)	Ariz.	293,353	25	12.00	3,520,236	(*q*)	(*q*)	(*q*)	Dec. '16	3.50
St. Mary's Min. Land.	Mich.	160,000	25	19.00	3,040,000	14.00	2,240,000	10,560,000	Oct. '17	2.00
White Knob C. & D., pf.	.....	200,000	10	.40	80,000	.30	60,000	220,000	Aug. '17	.10
Yukon-Alaska Trust	.....	203,433	.....	3.00	610,299	4.00	813,732	1,424,031	Dec. '17	1.00
Totals		.....	.....	.....	$23,271,660	.....	$11,020,185	$206,654,852	.....	.....
CANADIAN, MEXICAN, SOUTH AND CENTRAL AMERICAN MINING COMPANIES										
Amparo, g.s.	Mex.	2,000,000	$1	$0.21	$420,000	$0.16	$320,000	$2,652,176	Nov. '17	$0.03
Asbestos Corpn.	Que.	30,000	100	.....	.....	4.00	160,000	160,000	Nov. '17	1.00
Beaver Con., s.	Ont.	2,000,000	1	.03	60,000	.....	.....	649,912	Apr. '16	.03
Blanca y Anexas, s.	Mex.	140,000	10	.....	.....	.....	.....	1,943,000	Mar. '14	.90
B. C. Copper, c.	B. C.	591,709	5	.....	.....	.....	.....	615,399	Jan. '13	.15
Buena Tierra, s.l.	Mex.	330,000	4.86	.....	.....	.....	.....	160,380	Feb. '15	.24
Buffalo, s.	Ont.	1,000,000	1	.....	.....	.....	.....	2,787,000	July '14	.05
Butters' Salvador, g.	C. A.	150,000	4.86	1.12	168,000	.....	.....	4,138,050	Oct. '16	.24
Canadian Goldfields, g.s.	Can.	600,000	.10	.....	.....	.....	.....	290,000	July '14	.01¼
Caribou Cobalt,s.	Ont.	1,000,000	1	.....	.....	.05	50,000	175,000	Apr. '17	.05
Casey Cobalt, s.	Ont.	249,950	4.86	.....	.....	.....	.....	148,807	May '14	.12
Cerro de Pasco, c.	Peru	807,579	...	4.00	2,666,664	5.75	4,009,470	6,676,134	Dec. '17	1.25
Chontalpan, g.s.l.z.	Mex.	7,000	25	.....	.....	.....	.....	57,750	Apr. '14	.75
Coniagas, s.	Ont.	800,000	5	.75	600,000	.62½	500,000	8,940,000	Aug. '17	.12½
Con. M. & S. of Can.	B. C.	419,098	25	2.50	776,338	2.50	995,012	3,946,361	Oct. '17	.62½
Crown Reserve, s.	Ont.	1,768,814	1	.....	.....	.05	88,440	6,190,849	Jan. '17	.05
Dome Mines, s.	Ont.	400,000	10	2.00	800,000	.75	300,000	1,500,000	June '17	.25
Dos Estrellas, g.s.	Mex.	300,000	.50	.....	.....	.....	.....	10,335,000	Dec. '13	1.50
Encinas y Anexas	Mex.	3,000	10	.....	.....	.....	.....	30,105	Mar. '14	3.03½
El Favor, g.	Mex.	3,500,000	1	.....	.....	.....	.....	210,000	Apr. '14	.01
El Oro, g.s.	Mex.	1,147,500	4.86	.....	.....	.24	57,375	8,725,793	Nov. '17	.24
El Rayo, g.s.	Mex.	260,020	2	.....	.....	.....	.....	967,223	Dec. '15	.10
Esperanza, s.g.	Mex.	455,000	4.86	.....	.....	.24	109,200	12,217,398	Aug. '17	.24
Granby, s.l.c.	B. C.	149,985	100	7.00	1,049,894	10.00	1,499,850	8,375,109	Nov. '17	2.50
Greene Cananea, c.	Mex.	500,000	100	8.00	3,907,284	8.00	3,954,215	11,747,165	Nov. '17	2.00
Greene Con., (*n*)	Mex.	1,000,000	10	3.50	3,500,000	2.00	2,000,000	15,544,400	Apr. '17	1.00
Hedley Gold	B. C.	120,000	10	2.00	240,000	2.00	240,000	2,303,520	Dec. '17	.50
Hollinger, g.	Ont.	4,920,000	5	1.50	3,126,000	.15	738,000	7,314,000	Apr. '17	.05
Jimulco, c.s.	Mex.	10,000	100	.....	.....	.....	.....	1,065,000	Mar. '13	.01
Kerr Lake, s.	Ont.	600,000	5	1.00	600,000	1.15	690,000	7,410,000	Dec. '17	.25
La Rose Con., s.	Ont.	1,498,627	5	.20	299,725	.20	299,725	5,986,569	Oct. '17	.05
Le Roi No. 2, g.	B. C.	120,000	24.25	.30	36,450	.24	29,160	2,075,103	Mar. '17	.24
Lucky Tiger-Com., g.	Mex.	715,337	10	.72	515,043	.59	422,049	4,200,483	Dec. '17	.05
McIntyre Porcupine, s.	Ont.	3,610,283	1	.....	.....	.15	541,542	541,542	Sept. '17	.05
McK.-Dar.-Sav., s.	Ont.	2,247,692	1	.12	269,724	.12	269,724	5,146,223	Oct. '17	.03
Mexico Mines of El Oro, g.s.	Mex.	180,000	4.86	.....	.....	5.28	95,040	4,553,785	Dec. '17	.96
Mines Co. of Am.	Mex.	862,658	10	.....	.....	.....	.....	4,958,600	July '13	.12½
Min. Corp. of Can., s.	Ont.	1,600,050	5	.....	570,625	.93¾	1,556,297	2,905,047	Dec. '17	.18¾
N. Y. & Hond. Ros., s.g.	C. A.	200,000	10	2.00	400,000	2.00	400,000	4,590,000	Oct. '17	.50
Nipissing, s.	Ont.	1,200,000	5	1.25	1,500,000	1.50	1,800,000	16,740,000	Oct. '17	.50
No. Am. Magnesite	Que.	1,866	100	27.00	50,382	10.00	18,660	69,042	Oct. '17	5.00
Penoles, s.l.g.	Mex.	120,000	15	.....	.....	.....	.....	6,361,687	June '13	1.50
Peterson Lake, s.	Ont.	2,401,820	1	.07	168,127	.01¾	42,032	504,382	Jan. '17	.01¾
Pinguico, pf., s.	Mex.	20,000	100	.....	.....	.....	.....	840,000	Oct. '13	3.00
Porcupine-Crown, g.	Ont.	2,000,000	1	.12	240,000	.09	180,000	840,000	July '17	.03
Rambler-Cariboo, c.	B. C.	1,750,000	1	.05	87,500	.02	35,000	432,500	Sept. '17	.01
Right of Way Mines, s.	Ont.	1,685,500	1	.01½	25,283	.02½	8,428	577,469	Mar. '17	.00½
Rio Plata, s.	Mex.	373,437	5	.....	.....	.....	.....	345,745	Feb. '13	.05
San Rafael, g.s.	Mex.	2,400	25	.....	.....	.....	.....	1,442,380	Jan. '14	.50
Santa Gertrudis, g.s.	Mex.	1,500,000	4.86	.24	364,500	.18	270,000	3,089,772	Dec. '17	.18
San Toy	Mex.	6,000,000	1	.....	.....	.....	.....	530,000	July '13	.01
Seneca-Superior, s.	Ont.	478,884	1	1.25	598,605	.....	.....	1,579,817	Dec. '16	.05
Standard, s.l.	B. C.	2,000,000	1	.30	600,000	.15	300,000	2,700,000	Oct. '17	.05
Temiskaming, s.	Ont.	2,500,000	1	.09	225,000	.12	300,000	1,984,156	Nov. '17	.03
Tem. & Hud. Bay, s.	Ont.	7,761	1	.....	.....	.....	.....	1,940,250	Nov. '14	3.00
Tough-Oakes, g.	Ont.	531,500	5	.50	265,750	.12½	66,438	398,628	Jan. '17	.12½
Townsite Extension, s.	Ont.	150,000	4.86	.....	.....	.12	18,000	18,000	July '17	.12
Tretheway, s.	Ont.	1,000,000	1	.05	50,000	.05	50,000	1,161,998	Aug. '17	.05
Utica Mines, l.	B. C.	1,600,000	1	.....	.....	.04	64,000	64,000	Sept. '17	.02
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	.....	.....	.....	.....	637,465	Oct. '13	.05
Totals		.....	.....	.....	$24,180,894	.....	$22,477,657	$204,480 174	.....	.....

(*a*) Paid stock dividend equivalent to $12.50 per share. (*b*) Two classes. (*c*) Taken over by Utah Metal and Tunnel Co. (*d*) Liquidation dividend of $10.50 is included. (*e*) Includes return of capital; property sold to Tonopah Placers Co. (*f*) Includes liquidation payment. (*g*) Reorganized as Judge Mining and Smelting Co. (*h*) Absorbed by Mogollon Mines Co. in 1915. (*i*) Reorganization of Horn Silver Mining Co. (*j*) Includes stock dividend. (*k*) Reorganized as Kennecott Copper Corporation. (*l*) Liquidation payment of $11.85 per share is included. (*m*) Successor of Daly-Judge Mining Co. (*n*) Taken over in 1917 by Greene Cananea. (*o*) Called for redemption Nov. 15, 1917. (*p*) Dissolved in Mar., 1917; succeeded by Old Dominion Co. (*q*) Old Dominion Co. (holding) is included in the list of operating companies beginning 1917, as it has absorbed the Old Dominion Copper Mining and Smelting Co. "Total dividends to date" include payments by the Old Dominion Co., before the absorption. (*r*) See Old Dominion (holding).

The Assayer and Chemist

Using Gold Instead of Platinum for Laboratory Cathodes

By Fred F. Hunt*

The present high cost of platinum makes expedient the trial of other metals for use in electrolytic work in the laboratory. Gold cylinders used as cathodes and made as follows were tried and proved to be as reliable as those of platinum:

A piece of pure gold foil, 0.004 in. thick and 2¼ by 4½ in., is rolled into a cylinder, leaving ⅛ in. vertical space. Pure gold wires, about $\frac{1}{32}$ in. in diameter, are soldered around the top and bottom of the cylinder as close to the edge as possible and across the vertical space. A hard platinum wire is then soldered the full vertical length of the cylinder and is made long enough to suit the stand for electrolyzing. The solder used is 22-carat gold. These cylinders have been in use in my laboratory daily for months and their weights remain as constant as those of the all-platinum cylinders used under exactly the same conditions. Instead of hard platinum wire for the stem, hard-rolled gold wire might be used. Gold cannot be used for the anode.

Chilean Assay Terms Defined

The Chilean mining industry uses a series of terms and calculations more or less peculiar to the country. The more important of these are given in *Teniente Topics*, Vol. 2, No. 6. Terms used in relation to silver are defined as follows:

The *cajon* of minerals weighs 64 Spanish *quintales* of 100 lb. each, or 6400 lb. The *marco* is exactly 8 oz. avoirdupois, or 7.2912 oz. troy; it is equivalent to 226.8 grams (or roughly 230 grams). The expression *marco por cajon* signifies the number of *marcos* or units of 7.2912 oz. troy in 6400 lb., or 3.2 tons of 2000 lb. Multiply by 2.2785 to convert *marcos por cajon* into troy ounces per ton (U. S. ton of 2000 pounds).

The term *diez milesimos* (abbreviated D. M.) means one part by weight in ten thousand or one hundredth of a per cent. (0.01%). Thus, 300 D. M. signifies that in 10,000 parts of ore there are 300 parts, or 3%, of silver. Multiply by 2.9166 to convert *diez milesimos* into troy ounces per ton (U. S. ton of 2000 pounds).

A *milesimo* (abbreviated M.) is one part by weight in a thousand. It is used in speaking of silver bullion and is the equivalent of parts fine. Thus 970 M. would mean that the bullion contained 970 parts fine silver per thousand.

The expression grams per ton (metric) is also frequently used. Multiply grams per metric ton by 0.0322 to convert them into troy ounces per ton (U. S. ton of 2000 pounds).

Terms commonly used in speaking of gold are defined in succeeding paragraphs.

A *cien m..esimo* (abbreviated C. M.) is one part by weight in a hundred thousand, or one thousandth of a per cent. (0.001%). Thus, 8 C. M. signifies that in 100,000 parts of ore there are 8 parts of gold, or 0.008% gold. Multiply *cien milesimos* by 0.29166 to convert them into troy ounces per ton (U. S. ton of 2000 pounds).

An *onza por cajon* is one troy ounce in 6400 lb. Multiply *onzas por cajon* by 0.3125 to convert them into troy ounces per ton (U. S. ton of 2000 pounds).

The above calculations and rules are based on the following: Troy ounces per ton × 0.00343 = per cent. per ton; per cent. per ton × 292 = troy ounces per ton; avoirdupois ounces × 0.9114 = troy ounces; troy ounces × 1.0971 = avoirdupois ounces; grams × 0.0321 = troy ounces; grams × 0.0353 = avoirdupois ounces.

Determination of Sulphur Dioxide by Permanganate*

A method of determining sulphur dioxide in gas mixtures by titration with potassium permanganate has been developed in the industrial chemistry laboratory of Ohio State University. Permanganate is a more inviting reagent than iodine in oxidizing sulphurous acid, because the solution is more stable and can be used without an indicator. The results obtained, however, were not those that would be expected if the sulphurous acid were oxidized completely to sulphuric acid, although they were fairly harmonious. Dymond and Hughes[1] found that a part of the sulphurous acid was oxidized to the dithionate according to the equation

$$17H_2SO_3 + 6KMnO_4 = 2K_2S_2O_6 + K_2SO_4 + 6MnSO_4 + 6H_2SO_4 + 11H_2O$$

They also found that this reaction is not modified by the concentration of sulphuric acid present, the temperature, or by the dilution of the solution. These results have been confirmed in the development of the method described except that the concentration of sulphuric acid must be within certain wide limits and there must always be an excess of permanganate present.

It was found that 0.005 *N* potassium permanganate was the best strength to use, one drop of which corresponds to 0.000009 gram SO_2, the low normality making great accuracy possible. A stronger solution should be used for a very large concentration of sulphur dioxide. This solution was prepared by diluting the laboratory stock solution, which was standardized with purified sodium sulphite after being allowed to stand for several days. The sulphite method was checked by titrating measured volumes of pure sulphur dioxide gas dissolved in water.

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*Abstract of a paper entitled "Determination of Sulphur Dioxide," by O. R. Sweeney, Harry E. Outcault and James R. Withrow, in "Journ. Ind. and Eng. Chem." for October, 1917.

[1]Journ. Am. Chem. Soc., 71,314.

As stated above, the permanganate must always be present in excess. It was therefore impossible to titrate the sulphurous acid directly. Recourse was had to the scheme of the Selby Smelter Commission, described in *Bulletin 98*, U. S. Bureau of Mines. A certain amount of the permanganate was run into dilute sulphuric acid solution, and, after mixing, was divided into two equal parts. The sulphur dioxide was dissolved in one of the parts and standard permanganate was then added from a burette until the color again matched that of the other portion, the amount added being sufficient to oxidize the sulphur dioxide and still be in excess.

Preferred Strength of Permanganate Solution

Experiments showed that the best color to match was produced by adding 10 cc. of approximately 0.005 *N* permanganate to 490 cc. of water. It was observed that after the permanganate was reduced, the color on back-titration did not exactly match the original, but had a slightly redder tinge. If, however, the solution was reduced and oxidized once or twice before dividing the solution, then the color could be easily matched.

The solution should contain from 25 to 50 cc. of approximately 2 *N* sulphuric acid. Less than this amount gives a reddish colored solution difficult to match; more than this acts on the permanganate. Even when large amounts of sulphur trioxide accompany the sulphur dioxide it is generally safe to use 25 cc. of the double normal acid.

The reaction is complete in the cold and the titration is made at ordinary temperature. It was found that merely shaking the permanganate solution in the sample bottle, free from sulphur dioxide, caused no loss of color; hence it was not necessary to run a blank but merely to match color accurately. A little practice in color matching and comparison usually develops both accuracy and speed.

The apparatus used consisted of one 24-liter, or larger, bottle such as a carboy provided with a two-holed, properly cleaned, rubber stopper containing a large stopcock and a plug, to be used as a sample bottle; two 500-cc. glass bottles of uniform clear glass for titrating (to facilitate the color matching, these should be free from waves; one of the bottles should be provided with a two-holed rubber stopper containing a tube which will reach to the bottom of the bottle); a white background for titrating; one 1000-cc. bottle for diluting and mixing the permanganate solution; a 25-cc. burette; and a suction pump for evacuating the sample bottle and a manometer tube or gage to obtain the amount of evacuation. Two Nessler tubes should be provided for very accurate work.

Method of Procedure

The large sample bottle is evacuated and the pressure within noted and the temperature taken. When the sample is to be taken, the end of the stopcock is put in communication with the gases to be analyzed and the stopcock opened. The vessel is then closed and the temperature and the barometric pressure are noted. From this data the volume of the sample can be calculated.

About 475 cc. of water are placed in the 1000-cc. bottle and 30 cc. of 2 *N* sulphuric acid are added, after which 10 cc. of the recently standardized 0.005 *N* permanganate are run in. After mixing, the solution is divided about equally into the two 500-cc. bottles. Sodium sulphite solution, or sulphurous acid, is added to one of the bottles until the color is very faint, after which the color is roughly restored with permanganate. The solutions are now mixed and again divided. The burette is filled with standard permanganate solution and the position of the meniscus is noted. Such an amount of the solution is added to one of the bottles as will prevent the sulphurous acid from completely decolorizing the solution if this is likely to happen. The two-holed rubber stopper and tube are now placed in the permanganate bottle. The gas sample bottle is inverted and the end of its stopcock pushed just through the free hole of the permanganate stopper.

On opening the stopcock, removing the plug and inverting the sample bottle, the solution runs into the bottle. If the stopcock tube be bent at a right angle the sample bottle can be laid on its side and the liquid run by swinging the permanganate bottle through a half circle. After agitating the sample bottle and its contents for some time, the solution is run back into the small bottle and is titrated with permanganate until the color matches the other portion of the solution. It is again run into the sample bottle as before and then run out and matched closely with the other portion. This matching should be done against a white background, and for very close work portions can be compared in Nessler tubes. The total amount of permanganate run from the burette gives the amount of sulphur dioxide in the sample. The details of manipulation are the same as those so thoroughly worked out for the iodine method by the Selby Commission.

Permanganate Superior to Iodine for SO_2 Determination

This work has shown that permanganate is to be preferred to iodine for SO_2 determination for the following reasons: It gives as great accuracy; it is as easy to prepare and can be more easily manipulated; it can be operated on small traces of SO_2 as well as large amounts; it is more stable to light and gives a color as easy or easier to match than the starch-iodine end-point; it requires no simultaneous blank, and hence less apparatus to be transported in the field.

Determining Lead in Copper by Spectroscope

For the rapid determination of lead in factory samples of copper, a known weight of copper is placed in a slight cavity in a lower positive graphite electrode, and a fixed or rotating carbon negative electrode used above. The results are sufficiently reliable for practical use in the copper refinery, according to C. W. Hill and G. P. Luckey in a paper presented at the recent Pittsburgh meeting of the American Electrochemical Society. A grating spectroscope serves to observe the spectrum. The time required to cause the disappearance of the bright lead line in the spectrum, or to cause its enfeeblement to a certain dimness, is measured with a stop-watch. With carefully regulated arc, the periods vary regularly with the amount of copper used and with its percentage of lead, for example, from 14 sec. with 0.2 gram copper containing 0.004% lead to 277 sec. with 1 gram copper containing 0.038% lead.

Details of Practical Mining

Triangulation System Installed at the Paloma and Cabrillas Mines

By W. W. Adams*

In installing the triangulation system at the Paloma and Cabrillas mines, at Higueras, Coahuila, Mex., the area surveyed was about 5 km. wide by 6 km. long, the topography being exceedingly rough. Cliffs as high as 1500 ft. were found in the area triangulated. The system installed was accurate to one in 50,000 and all angles were turned 24 times. Both verniers were read and the angles estimated to 15″. The main base line had an inclination of about 5° and measured 1100 m., while the check base line was slightly more inclined and measured 300 m. The base lines were 3½ km. apart. Standard 100-m. tapes were used in measuring, corrections being made for temperature, sag, standardization and pull. All measurements were taken at night. An azimuth was secured by shooting at Polaris at elongation and the approximate longitude and latitude were obtained from government maps. Observations were accurate to 1′. The minimum horizontal angle between the main station was 28°, the main station being set in concrete blocks which were 0.4 m. in diameter by ½ m. in depth and were made of ¾-in. pipe, 18 in. long, with wings at the lower point. The centers were made of brass caps marked with crosses. The time consumed in actually making the survey was one month and two days, one engineer and two assistants being employed, while the computation took about six weeks with one engineer working. Actual measurement on the check base line differed from the computed length, which was determined by the main base line measurement and the angles used in the system, by 0.0008 in. Costs, in detail, are shown in the accompanying table.

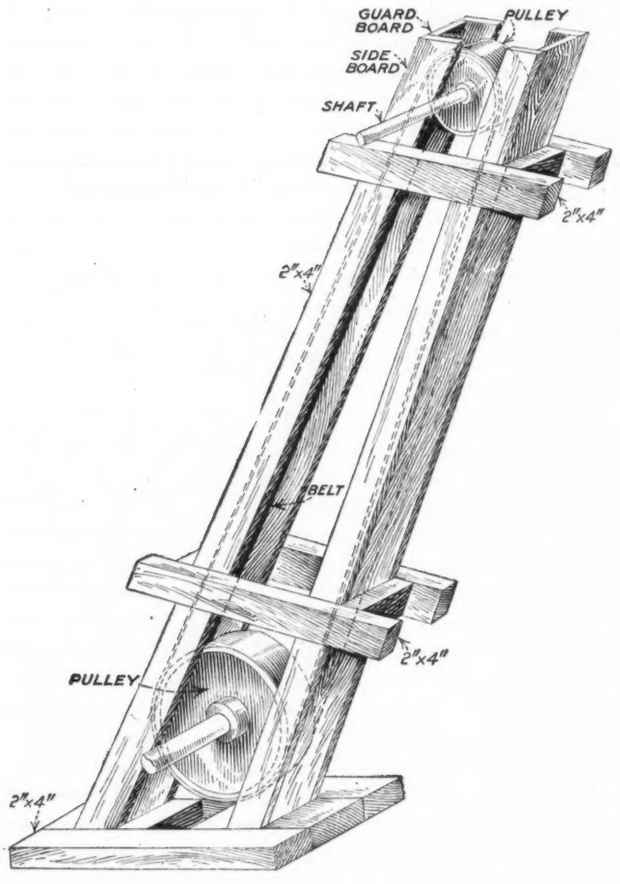
COST OF INSTALLING TRIANGULATION SYSTEM AT PALOMA AND CABRILLAS MINES

Reconnaisance of Terrain:	
Engineer	$25.00
Assistant	3.12
	$28.12
Establishing Monuments and Flag Staffs:	
Engineer	$50.00
Assistant	32.25
Cement	10.92
¾-in. pipe	3.92
1¼-in. pipe	30.12
Wire	0.90
	128.11
Establishing and Measuring Base Lines:	
Engineer	$123.00
Assistant	78.69
Wood	7.00
Transport	3.00
	$211.69
Measurement of Angles:	
Engineer	$90.00
Assistant	35.12
	$125.12
Computing and Arranging Data, Supplies, etc.	251.95
Total	$744.99

*Superintendent, Paloma and Cabrillas Mines, Higueras, Coahuila, Mex.

Removable Belt Guards

A method of guarding drive belts in mills, a safety precaution taken in some of the mills in the Southeast Missouri disseminated-lead district is shown in the accompanying illustration. The guard consists of 1-in. boards arranged to inclose the belts on three sides. The belts are given about a 2-in. clearance and the guards are held in place by floor frames and lightly nailed cross-strips. This arrangement facilitates the removal of the guards when belt repairs are required.



DETAILS OF REMOVABLE BELT GUARD

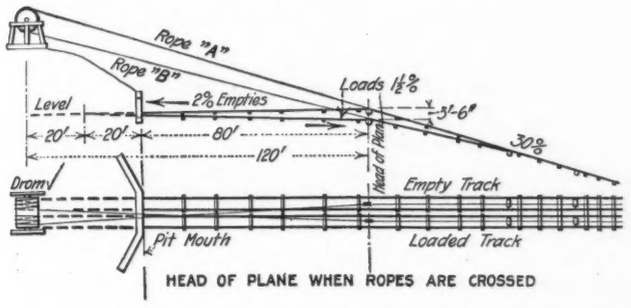
Novel Self-Acting Plane

A self-acting gravity plane, which is something of a departure from the usual type, is described by J. H. Smith in *Coal Age*. In this plane, which is double-tracked from head to foot, the loads always use the same track, while the empties always run over the other track. At the head, the empty track is higher than the loaded track, while at the bottom the reverse is true.

The following are some of the advantages of this type of plane: When a loaded trip is brought to the

pit mouth, the locomotive can switch over, couple to the empty trip, and go back into the mine without the delay of waiting till the trip is run down and returned to the head of the plane. With other types of planes, the locomotive either waits and pulls the empties ahead as they are landed, or a horse or some mechanical arrangement is used to do this work. But with the empty track higher than the loaded track, the empty cars will run away from, and the loaded cars will run toward, the knuckle.

No switch points, latches, frogs or wyes are required. This does away with derailments and collisions on the plane, which are frequently caused by a switch point



HEAD OF PLANE WHEN ROPES ARE CROSSED

or latch either being set wrong or else slipping out of place. The only disadvantage is the extra cost, arising from the wall or cribbing required at the plane head, and to the additional rail needed.

The operation of the plane is as follows: The rope *B* being on the empty side, the rope *A* is coupled to the loads, which are then dropped down the loaded track, as in the usual style of plane. At the foot, the coupler cuts it off from loads and fastens it (the rope *A*) to the empties. At the head, the rope *B* is uncoupled from empties, the end carried *under* the rope *A*, and then fastened to the loads. As the loads run down toward the blocks at the knuckle, they pass under and automatically lift the rope *A* to the top of the loads, from which it can be carried with ease and placed in the sheave in the center of the empty track. The trip is started down the plane, and as soon as stress comes on the rope *A* it straightens and takes the center of the empty track. (This trip is the one run with ropes crossed at the head, as will be noted by reference to the illustration.)

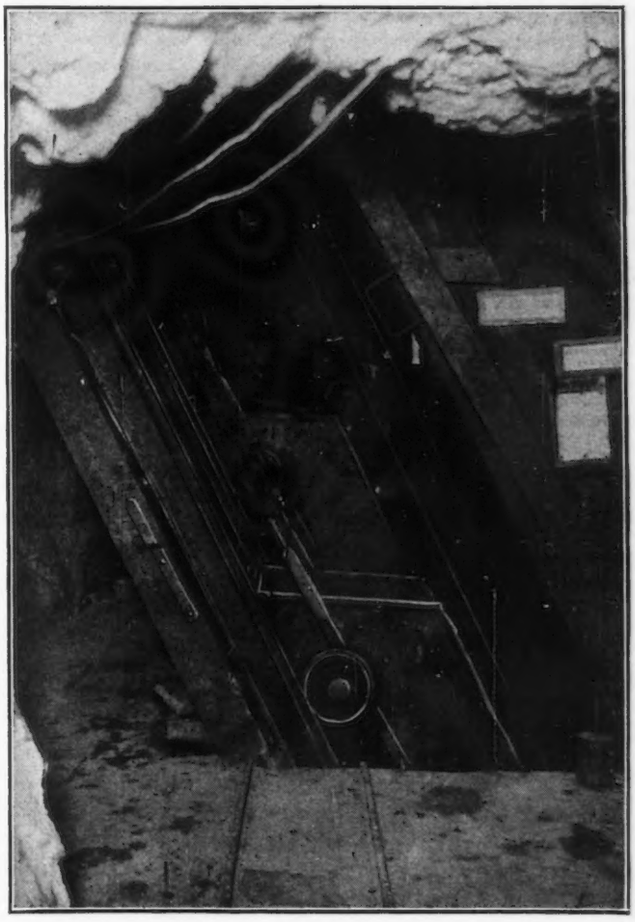
As one rope runs diagonally from the low side of the drum to the low side of the plane head (loaded track), and the other rope from the high side of the drum to the high side of the plane head (empty track), one rope does not come in contact with the other, even though they are crossed. (See illustration of side elevation.)

After this trip is landed, the rope *A* is uncoupled from the empty trip, the end carried *over* the other rope (*B*), and coupled to the loads. As the loads run forward they lift the rope *B*, which is carried by hand from the center of the loads (the top of the loads is about level with empty track) to the sheave in the center of the empty track. The trip is then run, but this time the ropes are not crossed.

A plane of this kind must have a uniform grade or lie concave to operate successfully. If it lies convex side up, the rope will not straighten to the center of the empty track. On line with the empty track, the rope must come from the bottom side of the drum; with the loaded track, from the top side. The drum (a wheel can be arranged to operate as satisfactorily) should be set back far enough to overcome the tendency of the rope to pull cars sideways, off the track. It also should be located high enough, so that the ropes passing over the sheave will make only a small angle. If the rope is supported at several points between the knuckle of the plane and the drum, this will eliminate trouble due to sagging of the ropes, and assist in passing the rope from center to center of the tracks.

A Simple Safety Device for Skips Handling Men

In hoisting or lowering men at the mines of the Mogollon Mines Co., formerly the Ernestine Mines, Mogollon, N. M., a safety attachment is used on the skip, built by the Denver Engineering Works Co., of Denver, Colo., which prevents jack-knifing in case of an accident that would result in the skip leaving the rails and tend-


SAFETY ATTACHMENT FOR SKIPS HANDLING MEN

ing to turn over. The device consists of an eye-bolt attached to the under side of the skip near the bale, through which a hook can be fastened from a chain attached to the bale. In the illustration the eye-bolt is shown, but with the chain disconnected. It is only while men are being hoisted that the device is used, as the chain is, of course, so placed as to be easily disconnected when ore is being handled, so that the skip can go into the cradle for dumping.

Events and Economics of the War

Following the criticism by the Senate committee of the conduct of Secretary Baker's department, a reorganization of the Army ordnance bureau has been effected; a bill has been introduced by Senator Chamberlain for creating a Secretary of Munitions. On Jan. 4, in an address to Congress, President Wilson recommended legislation to finance the railroads and protect the stockholders during the war period. An increase of demurrage rates was announced by Director General McAdoo, who asked also that an effort be made to unload all freight during the week just passed. On Jan. 8, in a second address to Congress, the President specified the terms upon which Germany may obtain peace. The Selective Draft Law was upheld by the U. S. Supreme Court in seven cases on Jan. 7. The House passed the Woman's Suffrage Amendment on Jan. 10. Mark L. Requa was appointed head of the oil division of the Fuel Administration.

Peace negotiations between Teutons and Bolsheviki at Brest Litovsk were broken off when the latter discovered that the Teutons desired to annex all occupied provinces; the parley was later reopened; the Ukraine has proclaimed its independence. There has been little activity recently on any of the war fronts. In the Italian hills snow has blocked the Austrian campaign. At Paris, ex-Premier Caillaux was arrested on a charge of treason. Yarmouth, England, was shelled by a German raider but little damage was done.

Publicity Forces Reorganization of Ordnance Department

The Secretary of War has approved a plan for the reorganization of the Ordnance Department, as announced in Gen. Crozier's testimony before the Senate Committee, and the plan is now being put into effect. Heretofore the business of the Ordnance Department has been conducted by five separate and more or less independent organizations under the direction of the Chief of Ordnance. These divisions will now be consolidated. The Chief of Ordnance will be assisted by an extensive administrative and advisory staff. The principal business functions of the department, as distinct from the technical designing and other scientific work with which it is charged, will be carried on by four operating divisions, namely, a procurement division, a production division, an inspection division and a supply division.

The procurement division will negotiate all orders and contracts for artillery, small arms, ammunition, and other articles heretofore purchased by the various divisions of the Ordnance Department. The production division will have general charge of the production. It will follow up, supervise and stimulate the production of all articles contracted for by the procurement division. The inspection division will inspect and accept or reject all munitions of war contracted for by the procurement division. The supply division will receive and distribute all ordnance and ordnance stores, operate all storehouses, and have charge of matters pertaining to transportation. Experienced business executives will be put in charge of the procurement and production divisions.

Production of Staples in 1917

Production of staple articles of food and manufacturing materials in 1917 shows large increases compared with that in 1913 with few exceptions, notably wheat and cotton, and even in these the value of the 1917 product is, by reason of high prices, far greater than that of 1913. According to statistics compiled by the National City Bank, corn production is more than 3,000,000,000 bu., against less than 2,700,000,000 bu. in 1913; sugar 2,225,000,000 lb., against 1,750,000,000 lb. in 1913; coal approximately 650,000,000 short tons, against 560,000,000 in 1913; pig iron about 38,000,000 long tons, against 31,000,000 in 1913, and copper more than 843,000 long tons, against 546,000 in 1913. The total value of mineral products is set down at approximately $4,000,000,000 in 1917, against less than $2,500,000,000 in 1913, and the wealth production of farms in 1917, according to the Department of Agriculture figures, is $21,000,000,000, against less than $10,000,000,000 in 1913.

The result of this tremendous increase in production, and especially in the value of the product, is shown in the fact that the total money in circulation increased from $3,363,738,000 on July 1, 1913, to $4,850,360,000 on July 1, 1917, or nearly 50%, and individual deposits in all banks, national, state, savings and trust companies increased from $17,745,764,000 in 1913 to approximately $26,000,000,000 on the corresponding date of 1917, also an increase of nearly 50 per cent.

Germans Work Serbian Coal Mines

Since the occupation of Serbia all its mines have been in the hands of German army engineers, who have so thoroughly organized the work upon them that it is generally believed the output has been increased considerably. Consul General D. I. Murphy, writing from Sofia, Bulgaria, under date of Nov. 12, 1917, reports that, according to the *Deutsche Balkan Zeitung*, of Sofia, an expert who has been looking over the Serbian coal fields, declares that hard and soft coal and lignite are found there in great abundance, offering excellent opportunities to capital. While it has long been known that Serbia was rich in coal lands, there were but 14 mines operating in the year 1910. The number had increased in 1914 to 22. The expert found 10 more places in which mines could be successfully operated, besides a rich field of coal near Usce, along the bed of the River Iber. Records show that the soft coal and lignite output in Serbia doubled between 1900 and 1910, 51,320 tons of anthracite, 16,622 tons of soft coal and 7899 tons of lignite having been mined in the latter year.

Demurrage Charges Increased

To speed up the loading and unloading of cars, Director McAdoo has adopted the plan of demurrage charges. The order directing the increase, which is effective on Jan. 21, is as follows:

All carriers by railroad subject to the jurisdiction of the undersigned are hereby ordered and directed forthwith to publish and file, and to continue in effect until further order, tariffs effective Jan. 21, 1918, wherein demurrage rules, regulations and charges shall be changed so as to provide:

A. (1) Forty-eight hours' (two days) free time for loading or unloading on all commodities. (2) Twenty-four hours' (one day) free time on cars held for any other purpose permitted by tariff.

B. Demurrage charges per car per day or fraction of a day until car is released, as follows: Three dollars for the first day, $4 for the second day, and for each succeeding additional day the charge to be increased $1 in excess of that for the preceding day until a maximum charge of $10 per car per day shall be reached on the eighth day of detention beyond free time, the charge thereafter to be $10 per car per day or fraction thereof. These charges will supersede all those named in existing tariffs applicable to domestic freight, and specifically contemplate the cancellation of all average agreement provisions of existing tariffs.

No change is authorized hereby to be made in demurrage rules, regulations and charges applying on foreign export freight awaiting ships at export points.

In the last week, designated "Freight-Moving Week" by Mr. McAdoo, an intensive effort has been made to unload cars and clear up congestion at railroad terminals.

Walsh-Pittman Bill Passes Senate

The Walsh-Pittman Oil and Coal Land Leasing Bill was passed by the Senate on Jan. 7 by a vote of 37 to 32 and was sent to the House. The bill had been pending in the Senate for four years. Its passage at this session was made possible by an agreement to except from its provisions the naval oil reserves, which action was urged by the Navy Department.

As finally passed, the bill provides for the general leasing of coal, phosphate, oil, gas and sodium lands by the Secretary of the Interior, with royalties to be paid to the Government, and for purchase of the lands by lessees under certain conditions.

A separate bill providing for the operation of the naval oil reserves by the Government, the leases of the present claimants to be obtained either through condemnation proceedings or by direct purchase was introduced by Senator Swanson, of Virginia, on Jan. 11. Under its terms the Navy Department is empowered to produce the oil and sell what it does not need for its own use, the money so obtained to go into an operating fund.

Requa Made Head of Oil Division of Fuel Administration

The organization of an oil division of the Fuel Administration, of which Mark L. Requa is to be the head, was announced on Jan. 10. A definite program of action will be adopted as soon as the Fuel Administration obtains a ruling concerning its powers, says the *Times*. Under the Food Control Act the words "fuel and fuel oil" are employed, and the Attorney General may be called upon to determine whether this wording covers kerosene and gasoline. The decision to assume control of the fuel-oil supply was hastened at this time, it was said, by the heavy demands of the navies of the United States and Great Britain. To the present demands will be added soon the needs of the new fleet of destroyers which the Navy is building. A thorough survey of the fuel-oil situation in the nation is being made by experts, and on this will rest largely the final decisions made. Distribution of output undoubtedly will be regulated, possibly under a licensing system. Price fixing is not included in the immediate plans of the Fuel Administration for oil control.

Army and Navy Departments Want Men of Engineering Experience

The Army and Navy staff departments continue to demand men of engineering experience, especially in industrial lines, and the outlook is that this demand will continue throughout the period of the war. In calling attention to this, the U. S. Public Service Reserve, Washington, D. C. (where records of men willing to serve when called will be kept on file), points out that a man of engineering experience has a rare combination of opportunities open to him, which are not open to the average patriotic American, as follows: To serve the country in his most effective capacity; to keep in touch with his own profession, with the result that his patriotic service will not have caused him to become rusty by the time peace returns; to become a commissioned officer and receive much better pay than the average man who has wholly subordinated personal interests and now works for the national good; to perform his service usually without leaving the United States.

Wire-Rope Exports Need Licenses

The attention of the Bureau of Exports has been called to the fact that attempts have been made to export wire rope, classified as galvanized wire, without an export license. Shippers have therefore been asked to take note that export licenses are required for all shipments of iron and steel wire rope, cable and strands consisting of six or more wires, whether or not the wires are painted, galvanized or coated in any way, and that it is necessary to obtain an export license for every shipment of this material. It should also be noted that to classify material improperly in order that it may be exported without a license subjects the exporter to the penalty of the law.

Coke Prices to Remain Unchanged

By reaffirmation of the President's order of Sept. 24, 1917, that all contracts and sales of coke made on and after that date must conform to the Government-fixed coke prices, the Fuel Administrator, Dr. Harry A. Garfield, indicated on Dec. 29 that there will be no general revision of coke prices for the year 1918. Prices for coke and raw materials used in manufacturing steel were established on Sept. 24 in the order mentioned, and it is understood that the base prices for coke will remain in force. Exceptions may possibly be made in cases where coke-production costs are exceptionally high and the output is important and enforcements of the order would result in shutting down operations.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Metal Exports in November, 1917

Marked increases in the quantities of metals exported, with the exception of spelter, are shown by the statistics of the Department of Commerce for November, 1917. Exports of refined copper, which amounted to 48,823,560 lb. in November, 1916, rose to 76,553,151 lb. in November, 1917. Lead to the amount of 16,817,080 lb. was exported in November, 1917, against 14,005,544 lb. in November, 1916. Spelter exports show a falling off. In November, 1916, forwardings were 44,275,495 lb., which dropped to 14,751,613 lb. in November, 1917.

Exports of refined copper for the first 11 months of 1917 were considerably in excess of those for the corresponding period of 1916. The figures are 947,299,546 lb. and 659,792,442 lb., respectively. Exports to France, Italy and to the United Kingdom increased markedly during the same period, while those to Sweden decreased from 14,935,451 lb. in 1916 to 2,229,013 lb. in 1917.

Lead exports fell off during the first 11 months of 1917, when they were 132,842,001 lb., as compared with 206,843,540 lb. in the same period of 1916. One of the features of the November, 1917, exports was the increase in the lead sent to Italy. In that month the aggregate of the forwardings to that country was 3,135,844 lb., while in November, 1916, only 672,585 lb. was sent. Exports to France and the United Kingdom increased, while those to Denmark, Netherlands, Russia, Sweden, Argentina, Brazil and Japan showed decreases. The decrease in exports to Sweden was most marked. In November, 1916, 6,132,466 lb. of lead was sent to Sweden, but only 112,031 lb. in November, 1917. The decrease in exports to Japan was from 32,989,494 lb. to 2,208,034 pounds.

Exports of spelter during the first 11 months of 1917 were 358,453,467 lb., while the figure for the same period of 1916 is 353,552,959 lb. Exports increased to Italy, the United Kingdom, Canada, Mexico and Asiatic Russia, while those to France, Norway, Russia in Europe and to Japan decreased.

Exports of quicksilver in November, 1917, amounted to 12,957 lb., which is considerably less than those of November, 1916, which were 74,222 lb. For the 11 months in 1917 and 1916, the figures are 779,700 lb. and 575,913 lb. respectively.

Alabama Graphite Men Want Imports Curtailed

Producers of graphite in Alabama feel that they have not been accorded fair treatment by the War Trade Board. They claim that the Government has opened the doors to a foreign product without making an effort to take advantage of domestic supplies which were immediately available. Owing to freight embargoes, the Alabama producers found it impossible to gain entrance to the graphite-consuming centers.

The Alabama producers have placed an extended statement of their case in the hands of Representative Heflin, in whose district are many of the mines. Mr. Heflin expects to call the attention of Congress to the allegation that ships sorely needed for other purposes are being used to bring graphite from Ceylon and Madagascar when a large part of the country's needs could be supplied from domestic sources.

Much difference of opinion exists as to the extent to which domestic flake can be used in the manufacture of crucibles. Some crucible specialists are of the opinion that manufacturers can modify their formulas so as to use practically all-domestic graphite. E. D. Seidel, of Philadelphia, who has been engaged in the manufacture of crucibles for 35 years, declares that good crucibles can be made with 100% Alabama flake. The Alabama Graphite Association hopes to settle this controversy by extensive experiments. The U. S. Bureau of Mines also is preparing to study the problem.

Time Short for Securing Licenses to Deal in Ammonia

Licenses must be secured before Jan. 21 by those engaged in the ammonia industries. The terms 'ammonia, ammoniacal liquors or ammonium sulphate, from whatever source produced," as used in the recent proclamation, mean only the prime products of ammonia as produced in byproduct-coke plants, coal-gas plants and nitrogen-fixation plants. This excludes druggists, wholesalers, and dealers handling secondary products only, as well as those using the prime products solely as ingredients in the manufacture of articles not subject to license under the above construction. The enforcement of the licensing regulations will be in the hands of an interdepartmental committee, headed by Charles W. Merrill, of the Food Administration.

Examine Tin Deposits of Black Hills

Although tin mining in the Black Hills of South Dakota has not been attractive to capital in normal times, Thomas Varley and R. R. Hornor, of the U. S. Bureau of Mines, have just completed a preliminary investigation of that region to obtain an idea of the amount of tin available if production cost were not the all-important factor. Mr. Varley was engaged 10 days on this work and Mr. Hornor devoted more than a month to his examination. Studies were made in the Tinton district in the northern hills and in the Hill City district of the southern hills. No conclusions have been formed pending analyses of samples.

Imports of Pyrites to the extent of 86,380 tons were reported for November, 1917. This was in excess of importations in November, 1916, which were 79,511 tons. The record for the first 11 months of 1917 shows that imports were 872,059 tons, as compared with 1,164,474 tons in the corresponding period of the preceding year.

EDITORIALS

WALTER RENTON INGALLS
Editor

MCGRAW-HILL COMPANY, INC.—JAMES H. MCGRAW, *President*

The Spelter Statistics

IN PUBLISHING our statistics of copper, lead and zinc for 1917 in our last issue there was not time to do anything more than present the figures practically without comment. The lessons that they teach must await deliberate consideration, and in some cases the presentation of supplementary figures. However, we may make certain deductions from the zinc statistics.

Comparing the grand total of 685,436 tons produced in 1917 with 680,018 tons in 1916, it might be inferred that the former was a year of great prosperity in the zinc business, but we know that such was not the case, and when we examine the quarterly and detailed statistics we perceive the statistical records of the year much more clearly.

Zinc production in the United States attained a maximum of 188,000 tons in the fourth quarter of 1916. In the first quarter of 1917 it fell off a little, but in the second quarter rose to nearly the quarterly maximum. If we had monthly figures we should probably find a time at about the end of the first quarter of 1917, or the beginning of the second, where there was a month of greater production than ever before in the history of the zinc industry of the United States. This was about the time when the new construction pending at the end of 1916 was going into use, when smelters were still hopeful that the wavering zinc market was going to have a "come-back," and when railway traffic conditions obscured the fact that surplus stocks were accumulating.

However, before the end of the second quarter eyes were opened to the situation, and curtailment of production began. In the third quarter the output was down to 161,668 tons, and in the fourth it had declined to 153,296 tons. The position of the smelters was worse even than is indicated by these figures, for the electrolytic producers nearly tripled their output in 1917, which may be considered to have been at the expense of the smelters.

The number of retorts in American smelteries at the end of 1917 was 217,194, compared with 222,326 at the end of 1916. Actually about 10,000 new retorts were added in 1917, but the dismantling of several old plants resulted in a small decline for the year. However, the figure reported for the end of 1917 is nothing but a statistical fiction in so far as anything practical is concerned, for many of the retorts enumerated in that total will never be used again. Many of the works that comprise them will be dismantled soon. At the end of 1917 there were only 864 retorts under construction. The era of new zinc-smelting construction has passed. Of the 217,194 retorts reported at the end of 1917, smelters who were operating had only 196,560, and of them only 127,193 were in use on Dec. 15. But, nevertheless, a spelter production at the rate of 600,000 tons per annum, which is what ours was at the end of 1917, is something to be viewed with a great deal of respect.

An interesting new feature of 1917 was the greatly increased production of the zinc in the form of dust, smelters reporting an output of 4600 tons of this, against 2318 tons in 1916. Yet a considerable tonnage of zinc dust was imported, although the amount was much less than in 1916. The imported dust is largely Japanese, which is able to reach certain of our markets, especially the Far Western, on better terms than American dust from smelters in the Middle West, because of the advantage of lower transportation costs.

Exports of spelter were even larger than in 1916, much of this being, of course, spelter that was contracted for in the latter part of 1915.

The production of refined zinc by redistillation was made by several smelters, who produced an aggregate of about 42,000 tons of this kind of spelter.

The American zinc industry is less brilliant and less profitable than it was in the halcyon days of 1915-16, but it may look back with pride to its record of having within two years multiplied its production by about 2½ and even now making an output at about twice the rate maintained in 1914.

No Munitions Ministry

THERE is to be no ministry of munitions in Washington. The Administration has pronounced against it. However, there is going to be reorganization in the departments and centralization that is designed to improve matters. What we shall have to wait to see is whether the new system is going to cut out red tape and confer authority upon the subordinates such as there is in any good business organization. If there be that improvement in practice, it may not matter what is the title and what is the form. The Army and Navy Departments have taken the bit in their teeth and purpose doing things in their own way.

Of significance is the ruling just made by Rear Admiral Samuel McGowan, Paymaster General of the Navy and executive head of the Bureau of Supplies and Accounts, that the Navy will purchase certain steel directly from the manufacturers without allocating the order with the Director of Steel Supply of the War Industries Board.

Prices which have been fixed by agreement between the manufacturers and the War Industries Board are maximum prices. Orders may be placed for any lower amount. Admiral McGowan's action therefore is taken to mean that he does not accept the price fixed as necessarily the fair price, but will place contracts at as low a figure as possible. The trend of thought in this regard is illustrated by the following statement from a prominent naval officer:

"The Navy and the Army are the two war arms of the Government, and each, in time, will get back to the system of supplying its own needs. No department of munitions will be created, and the War Industries Board

will lose what semblance of power it may have and become merely a board of advisers. The Navy has its own system. The Army will develop one."

The reorganization of the Bureau of Ordnance is indicative of the procedure which will be followed by the Army in the future. It is practically certain, says our Washington correspondent, that the Army will follow the system that has been developed by the Navy's Bureau of Supplies and Accounts.

The Navy purchasing has been a great deal better than that of the Army. In business circles the Navy has a good reputation for knowing what it wants and paying promptly, while the Army has a bad one. The Army is still owing copper producers for metal supplied to it last August and wraps up a transaction for 50,000 lb. with more detail and trouble for the seller than he experiences in furnishing 50,000,000 lb. to the Allies.

We hope that the new system will make suitable provisions so that the Army and Navy will not bid against each other and will have some consideration for what the shipbuilding department, the Food Administration, the railways, and other essential factors will require.

The Importance of Our Oil Shales

THE oil shales of the United States have lately attracted much attention, and they are undoubtedly of great interest and importance. We have here a vast reserve of fuel which will no doubt be fully utilized in the near future. That the Government is well aware of these potentialities is plain from several recent publications and from the fact that an area of the best material in Utah has been withdrawn from entry as a possible reserve of fuel oil for the Navy. A recent bulletin of the Geological Survey deals with the oil shales of the East, among which those of Devonian age from Kentucky and other states are the most valuable.

However, few of these shales compare in value with those from the plateau region in Utah, just referred to. These are persistent beds in the Eocene fresh-water formations and cover an area of about 5500 square miles in northwestern Colorado and northeastern Utah. Oil shale, as is well known, is defined as an argillaceous deposit from which petroleum may be obtained by distillation but not by trituration or treatment with solvents.

The oil shales of Utah, according to an interesting article in a recent number of *Economic Geology*, occur within a thickness of 200 ft. of these lake beds, and there are few places along the southern edge of the Uinta Basin in Colorado and Utah where there is not a thickness of more than 10 ft. of shale that will yield more oil per ton than the average which is being obtained from the oil shales of Scotland, and in places there are more than 100 ft. of such rich shale yielding 30 to 40 gal. per ton.

Interesting data have been obtained regarding the origin of the shale oil, particularly from the investigations of the late Dr. C. A. Davis, who did much to extend our knowledge about the peat marshes of the United States. From microscopic studies he reached the conclusion that the shale contains an immense amount of vegetable matter such as algæ, spores and pollen. There is but little animal matter and the oil is apparently indigenous to the shale and derived by slow processes of decomposition from the vegetable matter. Ammonia and other nitrogen compounds would represent valuable byproducts of the distillation of the material composing the oil-shale deposits.

Production and Ocean Transportation

ADMITTEDLY the greatest danger to the Allies is insufficient maritime transportation capacity. While Germany is able to supply herself with fuel and material from within her own confines, and has to carry things but relatively short distances, Great Britain, France and Italy have to obtain most of their food and raw material from abroad and have to fetch them long distances. This is one great reason why the war is far more costly to the Entente than to the Central Powers. It is the reason why if the loss of ships by submarines be too great victory may fail.

Neither the extermination of the submarines nor the building of new ships has proceeded as rapidly as was hoped. Shipbuilding must be speeded up and is being speeded up. Another thing that must be done is to concentrate upon the United States as the main source of supplies—wheat, petroleum, cotton, iron, copper, lead, zinc, everthing that we can furnish—for it does not involve so long a voyage to carry these things to Europe from America as it is from other parts of the world; wherefore there will be economy in the use of ships.

If this great demand is to be concentrated on the United States, we can meet it only by curtailing our consumption and increasing our production. In 1917 our domestic consumption was curtailed somewhat, but our production of many important things, iron and copper for example, did not increase. This reflects the blight of the price-fixing policy, which has had the same effect in every country that has tried it. Curtailment of consumption has been imperfect and sporadic when effected by arbitrary decree, instead of perfect and automatic, as it would have been by natural law; while, on the other hand, production, instead of being stimulated, has been chilled and checked. The only thing that remains to dull completely the edge of production is state control of industry. Before proceeding further in that direction, may we not possibly retrace some of the steps we have already taken and enable America to become the supply house of her Allies to a greater extent than she has yet been?

What Was the Cause?

MANY parts of the country, especially Eastern, comprising the greatest manufacturing districts, are short of coal, so seriously short of it that some factories must be closed while people suffer from cold in their homes. Is it not mortifying that such a thing has happened in our great, strong country? What are the Bolsheviki papers of Russia saying about it?

What was the cause creating the coal shortage? Maudlin reasons are given. The mines do not produce enough, say some. According to others they do produce enough. Bad coal, shortage of labor, shortage of cars, congestion of the railways, congestion in the terminals, congestion in the harbors, snow and ice, improper dis-

tribution—all of these are talked about and all of them have something to do with the situation.

But underlying all is the meddling with economic laws. That is the direction to which we must look if we seek the cause of the shortages.

BY THE WAY

In these days of conservation, why can not promoters, who invite us to subscribe (through the mails) to new projects, give us a rest? Think of the paper, postage and clerical work that would be saved.

"Hudson Maxim, inventor of high explosives, has made a food discovery which is to revolutionize eating," if we are to believe the New York *Evening Sun;* his discovery involves the Chinese soya bean. Prepared in the manner which he has invented, the bean is cheap and plentiful. It is said that it will make any dish, however unpalatable, taste exquisite. "I intend to offer my food invention to the American army and navy," said Mr. Maxim. "Considering its cheapness, it will give our fighting men the most inexpensive and the most delicious and the most nourishing ration of any of the armies of the world." If this be true, the romance of prospecting will be well-nigh shattered. Now that the high price of pork has made bacon only a sad memory, along comes a family of inventors of new explosives, machine guns and silencers to take away our old-fashioned *frijoles* and give us Maxim beans as a substitute.

There was one steam dredge in Oregon which has never had its epitaph written. When first built, capital was limited, and the dredge was a light one. After a few weeks of operation it was found that the buckets were not stout enough. A heavier line was purchased. Then the main drive engine did not have power enough to operate it. A larger engine was secured. The boilers failed to generate enough steam for the greater demands, so the owner installed boilers of greater capacity. The second day after operations were finally resumed, these heavier boilers suddenly dropped through the flimsy hull, and the ill-fated dredge went to the bottom. All of which goes to show, among other things, that "the life of a dredge is the life of its hull."

While "taking five," and encouraged by the companionable odor from his lighted pipe of Peerless, Dicky (erstwhile shifter at the Blank mine), propounded the following: "This 'ere minin' is queer, m'son, an' dam-me 'ow tha groun' do varry. Offen she's 'ard an' sometime she's sof, but thee never naws wot thee's got till 'ole job art through. Take this 'ere paintrock—why, dam-me' minin' 'er 's jus' like tryin' to get missus to change 'er min'—she'll never stay where she's to, an' once she's com' forth, she's loth to go back. An' 'ard groun! Why, dam-me son, I've see groun' that wert tha most infernal. Drill 'er, did we? Why, m'son, that there bloody rock was so 'ard that tha 'oles stuck h'out after us'n were through drillin'. An' 'ow's we makin' naow? Dam-me, don't b'lieve I 'ardly naws, but I figgers must strike paydirt pretty soon. Been down'earted lately, for seems though where h'ore is, h'ore is. An' where she bean't there be I. Let's 'ave bit moor o' that theer Peerless, m'son."

The extent to which women are taking the place of men in the mines of Germany is disclosed, says a Washington dispatch, by the following figures: During the last quarter of 1916 there were 37,563 women so employed, compared with 7265 employed in the same period of 1914. Youths employed in mines increased over 33%. In England approximately 1,000,000 women have gone into industry since the war started; in one trinitrotoluol factory 80% of the employees are women.

A donation of 75,000 pesos has been given to the School of Mines at Copiapó, Chile, by the Braden Copper Co. and the Chile Exploration Co., acting jointly. The money is to be paid in three yearly installments. The School at Copiapó is for the "training of foremen and engineers—men for the lower directive positions." In commenting on the gift, *Teniente Topics,* published at Sewell, Chile, by the Braden Copper Co., says: "The officials of North American mining companies operating in Chile are beginning to realize that greater use ought and must be made of local talent—in other words, for engineers and foremen (for the lower grades of positions), educated and trained in Chile. Heretofore, it has been thought necessary to import men—to contract them from the United States—but fortunately there is the sign of a big change. The only difficulty in the matter of substitution has been the limited supply of suitably trained men. . . . By giving this school financial assistance the Braden and Chuquicamata interests have taken a step in the right direction and are the ones that will benefit most."

Matti, the Finn

Walks with a limp, does Matti, the Finn;
Sleeve of his jacket hangs empty and loose;
Sullen he is and as ugly as sin,
Kind of a crabbed, decrepit bull moose.

Job's pretty soft, taking care of the "dry"
Place where the miners change twice every day;
Dry-men oft hold their jobs till they die;
Long as they're steady they're likely to stay.

Kind of a pensioner's job, don't you see?
Matti, the Finn, worries much over this;
Fate's game of checkers, we all must agree,
Seems to be played by no rule, hit or miss.

Once the best miner that went underground,
Slated for shiftboss was Matti, they say;
Careful and steady, with wits clear and sound;
Studied or worked every hour of the day.

One day his partner, young rattle-brained Pete,
Thought he'd encourage a shot that was slow;
Matt ran and threw the lad seventeen feet
Just as the blast took a notion to go.

Got to be dry-man for saving the skin
Of Peter, his partner, a foolhardy boy;
Sullen and silent is Matti, the Finn;
Reckon his life's pretty empty of joy.

LIEUT. CHARLES NICHOLLS WEBB.

Comfort Club for the 27th Engineers

The mail service at present is greatly disorganized. Much of our mail is late in arriving. Expected letters are not infrequently delayed for weeks by being missent. Some contributions to the Comfort Club for the 27th Engineers have met with such mishaps. We request that any contributor who does not see a prompt acknowledgment of his gift communicate with us in order that we may trace the missing letter. The list according to receipts to date is as follows:

Engineering and Mining Journal	$1000.00
New York Engineering Co.	1000.00
A Friend, Nov. 23	5.00
H. H.	5.00
D. E. Charlton	5.00
H. W. Hardinge	1000.00
Frank N. Spencer	5.00
W. L. Coursen	5.00
J. H. Polhemus	5.00
J. H. Janeway	10.00
Albert D. Beers	10.00
J. E. Hayes	10.00
J. A. Van Mater	25.00
L. Vogelstein & Co.	100.00
"Cuprite"	10.00
R. H. Bassett (Hanna Ore Mining Co.)	10.00
A Friend, Dec. 10	10.00
P. A. Mosman	10.00
American Zinc, Lead and Smelting Co.	100.00
J. G. H.	5.00
Daniel Guggenheim	100.00
A. H. H.	5.00
Willard S. Morse	25.00
August Heckscher	100.00
Anaconda Copper Mining Co.	1000.00
F. W. Bradley	100.00
Charles Le Vasseur	5.00
A Friend, Dec. 13	50.00
Freeland Jewett	10.00
Herman A. Wagner	5.00
Francis P. Sinn	10.00
R. C. Gosrow	5.00
J. H. Brickenstein	5.00
D. C. Jackling	100.00
"V"	10.00
E. E. Northrup	5.00
Rogers, Mayer & Ball	50.00
Denver Technical Staff, American Metal Co., Ltd.	30.00
A Friend, Jan. 9	100.00
E. B. Coolidge	10.00
J. V. N. Dorr	200.00
Pope Yeatman	50.00
W. H. Aldridge	50.00
Total	$5355.00

It is gratifying to note the contribution of the Denver technical staff of the American Metal Co., Ltd. It means teamwork and is indicative of a spirit that is valuable to any business organization. It will take teamwork to help us realize our aims. A Montana contributor sets us a mark to reach. He writes:

A word regarding the Mining Regiment, the 27th Engineers—a handful of men, 1500 out of two million enlisted men, that will represent the mining industry by actual mining operations in the first-line trenches:

The 27th Engineers should be one of the *crack* regiments of the whole American army sent abroad. We should make them feel that the mining men of the U. S. A. are behind them and willing to do anything in their power for their comfort and welfare, as it is a certainty that they will be under the baptism of fire most of the time. Special quarters could be provided for the boys behind the lines when they are off actual duty, where they could have all comforts. The only way we can show our appreciation of the boys' work is through the Comfort Fund for the Twenty-Seventh.

Let us make it $50,000 for a starter, and continue to subscribe as more funds are necessary.

"Fifty thousand dollars for a starter" is moderate. We raise our Montana friend and make it $100,000. It will be needed—every cent of it. There will be a constant drain on the Fund. Again we urge upon our readers two things: First, contribute; second, get others to contribute. Bring the Fund to their attention. Perhaps yours is the only *Journal* in the office. Make the checks payable to the *Engineering and Mining Journal.* Start something moving and watch the movement grow.

Bulletin No. 1 on Shipments of Tin

John Hughes, chairman of the subcommittee on pig tin of the American Iron and Steel Institute, issued to the tin trade on Dec. 28, 1917, the following circular letter, entitled "Pig Tin: American Iron and Steel Institute Bulletin No. 1":

On and after Dec. 10, 1917, all shipments of tin consigned to the British Consul General will be endorsed over to the American Iron and Steel Institute, to be released by the latter under guarantees approved by the War Trade Board, as set forth in the bulletin.

The British War Trade Department, acting through the rubber and tin exports committee, London, England, also issued notification on Dec. 11, 1917, that shipments against permits thereafter issued and on those outstanding would have the conditional consignment on the bill of lading as provided in bulletin No. 1, paragraph 9, namely,

American Iron and Steel Institute,
Notify . . . . . .

Beginning as of Dec. 10, 1917, the American Iron and Steel Institute is taking the guarantees provided for and endorsing bills of lading as required, at its offices, Room 2901, 61 Broadway, New York, and Room 606, Rialto Building, San Francisco, California.

To protect the interests of all concerned, the endorsement of the notified party will be required on all bills of lading before the institute will endorse such bills of lading over to the importer for custom-entry purposes. In cases where the endorsement cannot be obtained, a letter from the notified party authorizing release to the importer will be accepted.

The attention of importers, dealers and jobbers is particularly called to the conditions under which stock and jobbing parcels are to be released, as provided for in paragraph 13, Form No. 3. Under this arrangement the maximum amount which will be released to any one firm at one time will be (a) for stock 25 gross tons (to be sold in parcels of not less than five gross tons, or multiples thereof, as provided under guarantee); (b) for jobbing purposes 25 gross tons (to be sold in parcels of less than five gross tons, and to be reported on Form No. 4, as provided).

Parcels of tin released for stock must be accounted for as such; parcels released for jobbing must be accounted for as such; no transfers of tin from one class to the other will be allowed. Statement should be made on the guarantee (Form No. 3) covering the parcel in question whether it is to be held for stock (a) or for jobbing purposes (b).

These regulations will be strictly adhered to, and complete reports will be required on all parcels released for stock and jobbing purposes.

Record Output of Cement in 1917

The year 1917 holds the record for production of portland cement, a total of approximately 93,554,000 bbl. having been manufactured, an excess over the former high production of 1913 of nearly 1,500,000 bbl., and over the production of 1916 of more than 2,000,000 bbl., or 2.2%, according to the U. S. Geological Survey. The shipments in 1917, of approximately 90,630,000 bbl., fell below those of the record year, 1916, by nearly 4,000,000 bbl., or about 4%. Stocks at mills increased more than 2,800,000 bbl., or 33.7%, as compared with 1916.

Higher prices for cement prevailed throughout the United States except at a few plants in the Pacific Coast district. They were, however, accompanied by higher cost of manufacture. Demand for cement was generally good during the first five to eight months of 1917, but showed a decided falling off for the remainder of the year. Labor and traffic conditions were for the most part unsatisfactory.

Three new plants reported the production of portland cement in 1917: The Hercules, at Stockertown, Penn., the Fort Dodge, at Gilmore City, Iowa, and the Beaver, at Gold Hill, Ore., and one plant, the Giant, at Norfolk, Va., resumed operations after an idleness of several

years. The Lehigh district, comprising eastern Pennsylvannia and western New Jersey, produced 24,548,000 bbl. of portland cement in 1917, against 24,105,381 bbl. for the previous year, a total more than double that of any other cement-producing district of the country. The sections which had the greatest percentage increase in output in 1917 were Southern Indiana and Kentucky; Iowa, Minnesota and Missouri; and the Pacific Coast states.

Seek To Amend Excess-Profits Law

A committee representing the mining, oil, and gas industries, coöperating with the American Mining Congress, recently submitted to the War Excess-Profits Tax advisory committee a suggestion for an amendment of the War Revenue Act of Oct. 3, 1917, as it relates to excess profits. The committee's suggested amendment is as follows:

Be it enacted by the Senate and the House of Representatives of the United States of America in Congress assembled, that Section 207, of Title 2, of the act entitled "An act to provide the revenue to defray war expenses and for other purposes," approved Oct. 3, 1917, be amended by the addition of a new subdivison "C," reading as follows:

"That in the case of mines, oil and gas wells, the invested capital, at the option of the taxpayer, shall be (1) the average pre-war net income capitalized at 8%, and (2) paid-in or earned surplus and undivided profits used or employed in the business since the pre-war period, exclusive of undivided profits earned during the taxable year; provided, that in the case of mines, oil and gas wells having no pre-war net income, or acquired since the pre-war period, the 'invested capital,' at the option of the taxpayer, shall be (1) the net income for the year 1917 capitalized at 12%, and (2) paid-in or earned surplus and undivided profits used or employed in the business subsequent to the year 1917, exclusive of undivided profits earned during the taxable year."

The committee includes J. J. Shea, Oklahoma; A. G. Dickson, Pennsylvania; Herbert Pope, Illinois; Ravenel MacBeth, Idaho; A. G. Mackenzie, Utah; Emmet D. Boyle, Nevada; T. A. Dines, Colorado; A. Scott Thompson, Oklahoma; Victor Rakowsky, Missouri; Paul Armitage, New York; Archibald Douglas, Arizona, and Albert Burch, California.

Origin of Manganese in Shenandoah Valley in Virginia

WASHINGTON CORRESPONDENCE

With regard to the origin of the manganese deposits in the Shenandoah Valley of Virginia, the following hypothesis has been formulated by the geologists of the U. S. Geological Survey, who have recently been at work in this section:

Definite evidence concerning the source of the manganese that now makes up the workable deposits is lacking; but, from the data at hand, it appears that the manganese was originally widely disseminated as carbonate in the dolomite and limestone and possibly in silicates in other rocks found in the neighborhood of the deposits. The manganese was dissolved as bicarbonate and transported along established channels of circulation to the places where the oxides are now found, in clays produced by the previous decay of sericitic shales, limestone and dolomite. The oxides were probably deposited when and where the solutions containing manganese bicarbonates met oxygen-bearing waters. Manganese oxide appears to have been deposited largely by replacing the clay, although small quantities were deposited in open spaces. The largest deposits of manganese were formed in places where the maximum amount of manganese in solution met the most favorable conditions for deposition. Most complete rock decay and, therefore, solution of the maximum proportion of manganese in the rocks is probaby attained in regions of low relief having a thick cover of vegetation, under the influence of a warm, moist climate. As the process of solution would be most active in those parts of the region above the average level of streams and above ground-water level, more manganese should be delivered in solution to the belt of country where the ridges and hills meet the plains than elsewhere.

If not diverted by the local rock structure the maximum flow of solutions near the surface would have occurred near or under surface stream channels. Where oxidation was possible deposits formed in the stream channels themselves. As deeper circulation of surface waters was controlled by rock structure, troughs would have received the maximum circulation, although fault zones might have been locally favored. According to this hypothesis structural troughs were the most favorable channels for circulation, and if suitable conditions for oxidation and deposition existed they should be the most favorable places for accumulation.

Association of Sphalerite and Other Sulphides in Ores

Sphalerite is a common constituent of many types of ore. An interesting investigation to determine what its relations are to other minerals in a deposit, and also whether these are of any genetic significance, was undertaken by L. P. Teas[1]. Data were obtained from the study of about 200 ore specimens from 43 different localities, grouped according to their genesis, (1) Contact-metamorphic deposits; (2) deep-vein zone deposits; (3) intermediate-vein zone deposits; (4) shallow-vein zone deposits, and (5) meteoric-water deposits. The main facts brought out by the study of the blende-bearing ores examined showed: (1) Chalcopyrite as minute triangular or rectangular dots, or as stringers, is nearly always present in sphalerite that has been deposited by ascending juvenile waters, the amount apparently varying somewhat directly with the temperature and pressure of formation. The dots show a strong tendency to group themselves along crystallographic directions; (2) chalcopyrite, as minute dots or stringers, was not found in sphalerite deposited by meteoric waters; (3) sphalerite does not appear to carry silver compounds in visible amounts; (4) in all the ores examined, sphalerite is generally the first valuable sulphide and the second metallic sulphide deposited by ascending solutions; (5) sphalerite deposited by meteoric waters does not occupy a definite position in the series of minerals deposited.

Raise Fund for 11th Engineers

Civil engineers have formed an association the object of which is to provide for the wellbeing and physical comfort of the 11th Engineers (railway) and to render assistance to dependents at home of the men in the regiment, as far as it may be needed. This was one of the first volunteer regiments recruited after war was declared, one of the first to leave for France, and the first American regiment actively to participate in the war. It was this regiment that recently played a prominent part at Cambrai. In taking this action, the civil engineers at home are working along the same lines that the *Journal* is following in its efforts to raise the Comfort Fund for the mining regiment—the 27th Regiment of Engineers.

[1] "The Relation of Sphalerite to Other Sulphides in Ores," to be read at the February, 1918, meeting of the American Institute of Mining Engineers.

Personals

Have you joined the Comfort Club for the 27th Engineers?

H. H. Nicholson is making examinations in the potash lake district of northwest Nebraska.

G. L. Sheldon, of Ely, Nev., expects to go to Riverside County, California, on examination work.

Robert C. Sticht has returned to Australia and can be addresed at Queenstown, Tasmania, Australia.

Mark L. Requa has been appointed head of the newly organized oil division of the Fuel Administration.

George E. Farish returned from Central America on Jan. 1. He expects to be in New York until the first of February.

Augustus Clift has been appointed Minister of Agriculture and Mines in the reorganized government of Newfoundland.

Robert J. Anderson has resigned, effective Feb. 1, as chief chemist and metallurgist of the Cleveland Metal Products Co., Cleveland, Ohio.

S. F. Shaw is inspecting properties of the American Smelting and Refining Co. at Monclova, Coah., Bonanza, Zac., and Monterrey, N. L., Mexico.

Samuel W. Cohen, general manager of the Crown Reserve Mining Co., Ltd., has returned to Montreal after a six weeks' examination trip in California and Colorado.

Arthur J. Hoskin has resigned as editor of the "Mining American" to resume professional practice in mining and metallurgy, with offices at 717 Cooper Bldg., Denver.

Richard R. Trezona, of Eveleth, Minn., superintendent of the Fayal district of the Oliver Iron Mining Co. for the last 17 years, retired on Jan. 1 from active service.

W. P. Chinn, general superintendent of the Pickands Mather interests at Elba, Minn., has been appointed assistant general manager of the company with headquarters at Duluth.

Hon. G. D. Robertson has been commissioned by the Canadian government to investigate labor conditions in connection with the coal and steel industries of Sydney, Nova Scotia.

Benjamin Magnus was in Oklahoma and Colorado in December. He will return to New York early in February, visiting, meanwhile, plants in California, Montana and Canada.

George A. Butterworth, general manager of the South American Copper Syndicate, Ltd., who has been in New York for several weeks, will return soon to the mines at Aroa, Venezuela.

A. P. Watt will open offices in New York as metallurgist, where he will specialize on the concentration of ores. His address is 52 Vanderbilt Ave., Room 1903; telephone, Murray Hill 8860.

J. W. Wolff, geologist for the Oliver Iron Mining Co., at Duluth, Minn., resigned recently to engage in private practice. He will be associated with the Mines Efficiency Co., with offices at Duluth and Crosby.

George J. Young, recently professor of mining in the University of Minnesota, and previously in the Mackay School of Mines at Reno, Nev., has joined the editorial staff of the "Engineering and Mining Journal" as assistant editor-in-chief.

W. H. Crago, of Duluth, Minn., mining engineer with the Oliver Iron Mining Co., has resigned and will leave soon for the Belgian Congo, where he will be employed as engineer in charge of exploration work for the Union Minière du Haut Katanga.

H. De C. Richards, mining engineer, of San Francisco, was recently appointed consulting engineer of the Central Eureka mine at Sutter Creek, Calif. Mr. Richards was for a long time engaged in quicksilver mining in San Luis Obispo County, California.

J. H. McInnis, head chemist for the Interstate Iron Co., has been appointed assistant general superintendent for all the Jones & Laughlin interests on the Mesabi Range. **G. E. LeVeque,** chief engineer of the Interstate company, has been made superintendent of the Lincoln mine at Virginia, Minn. He is succeeded by **Robert M. Johnson,** engineer at the Letonia mine. **W. B. Rosenberger,** superintendent of the Grant mine at Buhl, Minn., has been appointed superintendent of the Mississippi mine at Keewatin.

Forest Rutherford, for many years metallurgist and general superintendent of reduction works for the Copper Queen Consolidated Mining Co. at Douglas, Ariz., has opened an office for consulting work, particularly along metallurgical lines, at 120 Broadway, New York.

Charles E. Locke, professor of mining at Massachusetts Institute of Technology, has been appointed to give a course of 45 mining lectures during the last three weeks of January at the Missouri School of Mines. **Prof. Carroll R. Forbes** of the latter school having entered military service.

Obituary

John Merton, superintendent of motive power of the Hecla division of the Calumet & Hecla Mining Co., died on Dec. 29, 1917, after many years of service with the company.

Thomas L. Livermore, vice president of the Calumet & Hecla Mining Co. for 21 years, died on Jan. 9 in Boston. A biographical sketch of Mr. Livermore will be published in a subsequent issue.

James R. Howley died at St. Johns, Newfoundland, on Jan. 1, 1918, aged 71 years. He was chief of the geological department of Newfoundland and director of government surveys. Mr. Howley had a long record of public service and was the author of numerous works on the natural resources of the island.

Societies

American Society of Civil Engineers met on Jan. 8 in the United Engineering Society Building, New York. B. F. Groat presented a paper entitled "Ice Diversion, Hydraulic Models and Hydraulic Similarity."

American Society of Mechanical Engineers, New York section, held its January meeting on Jan. 8 in the United Engineering Society Building. A paper entitled "Relation of Manufacturing to Banking and Research" was presented by Walter Rautenstrauch, professor of mechanical engineering at Columbia University.

American Association of Engineers—Pittsburgh chapter met on Jan. 14; Cleveland chapter, Jan. 15; New York chapter, Jan. 16; Chicago chapter, Jan. 18; Philadelphia chapter, Jan. 18. The following future meetings are announced: Washington chapter, Jan. 21; Richmond chapter, Jan. 23; Savannah chapter, Jan. 25; Birmingham chapter, Jan. 28; Atlanta chapter, Jan. 29; and Cincinnati chapter, Jan. 30.

Mining and Metallurgical Society of America—At the annual meeting in New York, Jan. 8, it was reported that the ballot for officers for 1918 had resulted in the election of W. R. Ingalls, president (re-elected); J. Parke Channing, vice president; and Louis D. Huntoon, secretary (re-elected). Messrs. F. W. Bradley, James R. Finlay, Pope Yeatman, J. V. N. Dorr and R. C. Gemmell were elected councillors. It was announced at the meeting that the gold medal of the society had been awarded to Pope Yeatman for distinguished service in the administration of mines. It was further announced that Prof. James F. Kemp and Dr. James Douglas had been elected honorary members of the society, for which nomination by 20 members and the unanimous vote of the council of 15 are necessary. Following the annual dinner, J. P. Hutchins described recent conditions in Russia and F. W. Draper related how he brought out $2,000,000 worth of platinum, which was recently reported in the newspapers.

Industrial News

Gustave A. Overstrom and **Charles V. Craig** have entered into a contract for handling "Universal" concentrators, covered by application for patent under Serial No. 132387, by which Mr. Craig undertakes the manufacture and sale of the machines and becomes a half owner of the patents thereon.

Chicago Pneumatic Tool Co., Chicago, announces that its motor-truck interests were taken over on Jan. 1 by the newly formed Little Giant Truck Co., which is owned and controlled by the former company and has the same officers. Headquarters of the new company will be in the Little Giant Bldg., 1615 Michigan Ave., Chicago.

R. D. Nuttall Co., Philadelphia, manufacturers of gears, pinions and trolleys, announces that Milton Rupert has been elected vice president and assistant treasurer of the company. Mr. Rupert has been with the company since 1893. In his new position he will have charge of sales and manufacturing activities.

Hyatt Roller Bearing Co., Newark, N. J., announces that D. Gleisen is manager of the industrial bearings division. Mr. Gleisen is a mechanical engineer, a graduate of Stevens Institute, and has been connected with the company for the last six years. He was formerly assistant manager of the Hyatt company in charge of bushings sales.

Georgia Pine Turpentine Co., New York, is making extensive improvements at its plants at Collins, Ga., and Fayetteville, N. C., due to the increasing demand for pine flotation oils. Some months ago the company established a distributing point at Salt Lake City, with S. S. Skelton as Western manager. Mr. Skelton is stocking a complete line of pine products at the Culmer Co. warehouse.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Air Compressors—Valve for Air-Compressors. George M. Richards, Philadelphia, Penn. (U. S. No. 1,251,420; Dec. 25, 1917.)

Alloy—Steel, Containing Ni, Cr, Mo, Ti and Mn. James Churchward, Lakeville, Conn. (U. S. No. 1,251,341; Dec. 25, 1917.)

Aluminum — Method of Precipitating Aluminum Hydrate. Ralph S. Sherwin, East St. Louis, Ill., assignor to Aluminum Co. of America, Pittsburgh, Penn. (U. S. No. 1,251,296; Dec. 25, 1917.)

Aluminum Nitride, Production of. Paul R. Hershman, Chicago, Ill., assignor, by mesne assignments, to Armour Fertilizer Works, Chicago, Ill. (U. S. No. 1,250,874; Dec. 18, 1917.)

Barium—Process of Making Oxide and Hydroxide of Barium. Benjamin Peacock, Philadelphia, Penn., assignor to Larrowe Construction Co., Detroit, Mich. (U. S. No. 1,250,642; Dec. 18, 1917.)

Casting or Molding Device. Edward G. Cook, Long Island City, N. Y., assignor, by mesne assignments, to Copper Products Co. (U. S. No. 1,250,803; Dec. 18, 1917.)

Cement and Potassium Compounds, Process of Producing. Carleton Ellis, Montclair, N. J., assignor to Ellis-Foster Co. (U. S. No. 1,250,291; Dec. 18, 1917.)

Drill—Rock Drill. George H. Gilman, Claremont, N. H., assignor, by mesne assignments to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,250,931; Dec. 18, 1917.)

Drill—Rock-Drill. William H. Leonard, Denver, Colo., assignor to the Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,251,391; Dec. 25, 1917.)

Drilling Apparatus. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,250,933; Dec. 18, 1917.)

Drill-Sharpener. William A. Smith, Denver, Colo., assignor to the Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,251,434; Dec. 25, 1917.)

Electrolysis — Electrolytic Recovery of Metals from Their Solutions. Urlyn Clifton Tainton, Johannesburg, Transvaal, South Africa. (U. S. No. 1,251,302; Dec. 25, 1917.)

Electrolytic Apparatus. John Coulson, Wilkinsburg, Penn., assignor to Westinghouse Electric and Manufacturing Co. (U. S. Nos. 1,250,146 and 1,250,286; Dec. 18, 1917.)

Electrolytic Apparatus. Lewis W. Chubb, Edgewood Park, Penn., assignor to Westinghouse Electric and Manufacturing Co. (U. S. No. 1,250,141; Dec. 18, 1917.)

Electrolytic Cell. Henry Charles Jenkins, London, England. (U. S. No. 1,250,183; Dec. 18, 1917.)

Filter. Arthur J. Brown, Milwaukee, Wis. (U. S. No. 1,250,275; Dec. 18, 1917.)

Flotation Apparatus. William E. Greenawalt, Denver, Colo. (U. S. No. 1,250,303; Dec. 18, 1917.)

Motor — Pressure-Fluid Motor. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,250,932; Dec. 18, 1917.)

Peat, Treatment of. Thomas Rigby, Dumfries, Scotland, assignor to Wetcarbonizing Ltd., London, England. (U. S. No. 1,251,422; Dec. 25, 1917.)

Refining—Electrode Used in the Electrolytic Process of Refining Metals. Frank Linden Antisell, Perth Amboy, N. J. (U. S. No. 1,250,757; Dec. 18, 1917.)

Slag—Method of and Apparatus for Recovering Volatile Metallic Values, in the Form of Metallic Oxides, from Molten Slag. Herman Witteborg, Caldwell, Idaho. (U. S. No. 1,250,261; Dec. 18, 1917.)

Editorial Correspondence

SAN FRANCISCO—Jan. 9

Comstock Mines at Northend and Gold Hill made a good production in the closing week of December. Production was recorded by Union Consolidated, Ophir and Andes at the north end, and by the Jacket at Gold Hill. Union Consolidated produced a total of 441 tons, containing $10,574 in silver and milled at the Mexican mill 395 tons that averaged $25.38 per ton. Ophir production was light, 16 cars assaying $8.60 per ton. Andes produced 51 cars averaging $10 per ton. Jacket produced 411 cars of fair-grade ore, sent 300 tons of mine ore to the mill bins and 340 tons from shaft bins to mill gloryhole. Development in the several mines operating showed progress in the Union, Ophir, Mexican, Sierra Nevada, Con. Virginia, Jacket and Alpha & Exchequer. Christmas was generally observed along the Lode. The pumping plant in the C. & C. shaft was closed down only four hours, the time being occupied in cleaning 2310-level pump tank.

New Oil Wells Started in 1917 in California totaled 984, according to the records of the oil and gas department of the State Mining Bureau. In the closing week of the year ended Dec. 29, the number of new wells started was five, or less than half of the number started in the preceding week. The total for the half month was 18. Wells reported for redrilling or deepening, 13; for test of water shut-off, 34; abandoned wells, four. The companies which began drilling for new wells in the two weeks were: Associated, five; Standard, four; General Petroleum, two; Potter, two; Santa Paula, two; and Petroleum Midway, C. C. M. & O., Oak Ridge, one each.

Standard Oil Co. is reported to have optioned land in the vicinity of Suisun and Fairfield, Solano County, with the evident purpose of drilling gas wells, possibly oil also. The land is near the gas well drilled by the Rochester Oil Co. in 1901, eight miles northeast of Suisun. Gas was tapped by that well at a depth of 1520 ft., which was deepened 300 ft. without improving the production. The well was abandoned for three years and later four other holes were drilled without results. Salt water came up with the gas and was used by local butchers as a brine. The gas for a time was used for fuel in Fairfield and Suisun. No drilling has yet been done by the Standard, but it is reported that oil experts employed by that company have considered geological conditions favorable to the presence of oil. It is reported also that Los Angeles men have optioned lands in the same region including the Keyes ranch, on which the Rochester well is situated. Indications of oil have been reported in the vicinity of Vallejo, about 15 mi. southeast.

Compensation Laws Were Amended in 1917 in California in several particulars, the changes becoming effective Jan. 1, 1918. One of the important changes requires every employer of labor, except state and state institution employers, to secure the payment of compensation in one of the following ways: (a) By insuring and keeping insured in an insurance company duly authorized to write compensation insurance in this state; or (b) by securing from the Industrial Accident Commission a certificate of consent to self-insure, which may be given when satisfactory proof of the employer's liability to carry his own insurance is furnished. The commission will require such employer to deposit with the state treasurer a surety bond or securities approved by the commission, in an amount to be determined by the commission. Failure to secure payment of the compensation subjects the employer to added liability of an action at law that may be brought by the injured employee, and the employee shall be entitled to the right to attach property of the employer to secure payment of judgment. In such action the employer is denied defenses of contributory negligence, assumption of risk and negligence of fellow servant; and the negligence of the employer is presumed. Certificates of consent to carry self-insurance and any further information may be obtained by application to the commission at 525 Market St., San Francisco.

BUTTE—Jan. 9

Philipsburg Manganese Shipments have been going out at the rate of 9000 tons per month to the steel works in the East. Prospectors in the hills are making new finds daily and in mining the high-grade manganese ores large tonnages of low-grade is being blocked out by the mining companies. High-grade ore continues to be shipped to Philadelphia and other Eastern points.

Butte Miners' Union Property will not revert to the Western Federation of Miners. Decrees of the U. S. local courts denying the right of the Western Federation of Miners to possession of the property of the Butte Miners' Union, were in effect upheld Jan. 14, when the Supreme Court at Washington, declined to review them. The suit grew out of the withdrawal from the federation of the Butte union.

Copper Production for 1917 from Butte, disregarding the two months' shutdown during the I. W. W. trouble, must be regarded as satisfactory. The North Butte company produced a good tonnage, although crippled for many months by the fire at the Granite Mountain shaft when 164 lives were lost. Despite the elaborate precautions taken by all Butte companies the fatality list of 1917 was the greatest on record for the district, the total amounting to 327 deaths. The East Butte company produced steadily except for the six weeks' shutdown during the labor trouble. This company made its record production in December and an even higher record is expected for January. Butte & Superior mined 460,000 tons of ore, averaging 15.5% zinc and 6 oz. of silver per ton and ended 1917 with an ore reserve equal to that of previous years. At the Colorado mine of the Davis-Daly company, 38,427 tons was hoisted with an average of 6% copper. The Hibernian shaft is at a depth of 400 ft. and shows high-grade silver-zinc ore. But little new development in the older mines of Butte was possible in 1917 as all the labor available was needed for production. The reduction works of the Anaconda and East Butte companies underwent a number of improvements. At Anaconda erection work was started on a new 525-ft. brick smeltery stack, 60 ft. in diameter, designed to eliminate the possibility of fume damage in the Deer Lodge Valley. The capacity of Anaconda's brick plant has been increased from 18,000 to 35,000 bricks per day to provide the 25,000,000 bricks that will be necessary for this new structure. At Great Falls, Anaconda increased its smeltery capacity and nearly completed the wire mill. Some of the machinery has arrived and the plant is expected to be in commission about the first of May. An increase in the capacity of the zinc plant and the establishment of a brass works at Great Falls is in contemplation.

LEADVILLE, COLO.—Jan. 10

Production of Leadville for 1917 in metals was: Gold, about 60,540 oz., silver, 2,488,238 oz., lead, 24,902,777 lb., copper, 2,593,943 lb., zinc, 85,389,235 lb., manganese, 36,272 tons (Mn). Production of ores in short tons was: Carbonates, 8734, iron oxide, 32,073, manganese, 185,391, zinc (all classes), 214,676, siliceous, 10,152, sulphide (other than zinc), 143,701; total, 594,727 tons.

Ores as Low as 28% Manganese are now acceptable by the steel manufacturers. Ore with 40% manganese is rare in Leadville and in 1916 nothing less than this could be marketed. At the beginning of 1917 ore containing 35% manganese became acceptable and 30% came into demand during the last quarter. Leadville has the possibility of a tremendous tonnage of 30% ore and the demand has caused a revival of mining prosperity on a scale not experienced for many years. There are now 17 mines, producing about 700 tons of manganese ore daily. Six of these properties were opened in 1917 and 11 have been active for a longer period. The biggest producers of manganese in the district are: The Yak, the Western Mining Co., Star Consolidated Mining Co., Down Town Mines Co., Iron Silver Mining Co., Ibex Mining Co., and the Leadville Unit. The Yak will be subjected to a most vigorous campaign of exploration, which may include the driving of the main bore through the Mosquito range into the rich section surrounding the London mine in Park County.

WALLACE, IDAHO—Jan. 9

Labor Shortage will be a serious matter for the operating companies of this district unless something occurs to stop the departure of the men which has been taking place during the last several weeks. Most of the companies are now running short-handed. A great many men have drawn their time at various mines of the district and departed for Butte. Many of these men came here several months ago when the strike was called in Butte, and the formal calling off of the strike has probably induced them to return, as the wages are 25c. a day higher, and as an additional inducement, Butte is wet while the Coeur d'Alene district is dry. According to the terms of the sliding scale of wages in the Coeur d'Alene district, there should now be a reduction of 50c. per day, making the rate $4.25. However, there seems to be no disposition among the mining companies to make the reduction, particularly in view of the difficulty in securing men at the present rate.

Closing of Green Hill-Cleveland Mine has been decided upon and it will end its long career as a lead-silver producer within a few days. While the life of the Green Hill-Cleveland was comparatively short, its exhaustion marks the end of continuous production from a bonanza orebody, covering a period of practically a quarter of a century. What is known as the Green Hill-Cleveland is the outgrowth of two famous early-day mines of the Coeur d'Alene district, the Standard and the Mammoth. John A. Finch and A. B. Campbell, two pioneer and successful operators, secured a bond on the Standard in the early 90s for $20,000 and drove a crosscut 3000 ft. to cut a vein which they believed to exist in the ground secured, but of which there was no evidence on the surface. Their judgment proved correct and they struck one of the richest lead-silver ore bodies found in the district, and the development of which earned large profits during subsequent years. In the meantime, the Mammoth, adjoining the Standard on the west and higher up the mountain, was being developed by the original owners, who were successful in finding the Standard-Mammoth ledge near the surface, and in it the crest of the great oreshoot in the form of high-grade lead-carbonate ore accompanied by much native silver. Shipments from this strike paid for the subsequent developement of the Mammoth, which made millionaires of the owners, all of whom were poor men. In the fall of 1903, the Federal Mining and Smelting Co. purchased the Standard and Mammoth for $3,000,000 and consolidated them. The combined property was worked with great success until 1912, when, in anticipation of an early exhaustion of the orebody, negotiations were opened for the purchase of the Green Hill and Cleveland claims, joining the Mammoth on the west and containing the extension of the great orebody. These negotiations were only partially successful, two of the owners, William R. Leonard and James Leonard, refusing to sell. The result was the organization of the Green Hill-Cleveland Mining Co., the stock of which was divided on a 50% basis between the Federal on the one hand and the Leonards on the other. Since that time, the company has been operated under Federal management. The famous oreshoot was profitably worked to a depth of 2250 ft. below the main working tunnel, and to a maximum depth from surface of about 3500 ft. But its limits have been reached. The old stopes, drifts and crosscuts are now being finally cleaned up and within a few days the pumps will be hoisted and the mine allowed to fill.

HOUGHTON, MICH.—Jan. 12

Lake Superior Copper Mines in 1917 showed a decrease in copper production over that of 1916. The output in point of tonnage was, however, about the same, which indicates a return to the mining of normal-grade ore after the intensive campaign conducted by the three most important south range producers, the Cham-

pion, Trimountain and Baltic, who mined the highest-grade ores during the high-copper market. The same situation also existed at the Mohawk. The Calumet & Hecla smeltery has handled single masses of native copper, weighing 11.5 tons cut from the Ahmeek mines and the Quincy is proposing to handle eight-ton cuts. The Calumet & Hecla production for 1917 was a little better than for 1916, but includes the output from the Tamarack, which formerly was listed separately. Flotation experiments conducted by the various Lake Superior copper companies have lead to hopeful conclusions, notably at the Calumet & Hecla, and it is anticipated that the Stanton companies, the Mohawk, Wolverine and White Pine Extension and the Copper Range, if not the Quincy and several others, will eventually adopt the process for the retreatment of tailings. Within three weeks the additional turbine for Calumet & Hecla power plant at Lake Linden will be in commission to furnish additional power for the main mine and subsidiaries as required. More electric locomotives for hauling tram cars underground are going into operation in January, some on the Osceola lode at the Calumet & Hecla, some at Isle Royale and some at Ahmeek.

DULUTH, MINN.—Jan. 10

Car Shortage is being ameliorated by the action of Duluth-operated railroads, which are supplying iron-ore cars for the movement of coal during the winter months. The Duluth, Messabe & Northern R.R. has just released 1200 of its ore cars to the Elgin, Joliet & Eastern R.R. and the Duluth & Iron Range R.R. has supplied over 1000 cars to another coal-handling railroad operating from Chicago. It is announced that the Northern Pacific, Soo Line, and the Great Northern roads have arranged to release a great number of their cars to facilitate coal shipments. The Northwestern railroad will supply 2000 ore cars from its Ashland division, and 1000 from its peninsula, for use in carrying coal on other portions of the system. This is the first time that the iron-carrying roads have let their cars go in any large numbers on account of the difficulty in getting them returned when the shipping season starts.

JOPLIN, MO.—Jan. 12

Three Killed in Hoisting Accident at the Mahutska mine at Picher, Okla., when the hoist brake refused to work. Four men being lowered were dropped a distance of about 200 ft. There was no one underground at the time and the men were pulled back up by the hoisterman, three of them fatally wounded. They died the next day. The fourth is seriously, if not fatally, injured.

Application of the Flotation Process in the concentration of ores in this district is being carefully studied by Albert Roberts, a representative of the Minerals Separation company. Two representatives visited this district last summer and as a result of their investigations and conclusions, the company has reduced royalty rates for this district, making it ⅝c. for zinc concentrates, and ⅜c. for lead, where the lead is recovered and sold. If the lead is not recovered no charge is made for it. In a talk to operators, Mr. Roberts estimated that only mills handling as much as 400 tons of ore daily could possibly use flotation profitably, and even then the slimes must be fairly rich. However, he declared it probable that many mines would find the process well worth while in this field.

Zinc Rolling Mill Project is arousing enthusiasm in this district and received a further stimulus at this week's meeting of mine operators at Webb City, when Guy H. Waring, a chemist and engineer and owner and manager of the Oronogo Mutual Mining Co.'s property, reported that a complete 60-ton mill could be erected for $200,000. Original estimates, made by him some time ago, were multiplied by three to provide amply for the increased cost of materials, he said. He also estimated that at the present price of sheet zinc it would be possible for the mill to pay for itself in a few weeks after getting in operation. Another activity of the operators is extending in the direction suggested by "Engineering and Mining Journal," a few weeks ago, to the effect that new uses for zinc should be sought by the smelters. The manager of a local foundry visited St. Louis during the week and sought information as to what is being done along this line. He reported that one company is seriously considering the advisability of making burial caskets of zinc, and that this company, which is one of the big spelter producers of the country, is also studying the matter from numerous other angles. He stated that one of the leading manufacturers reported a better demand for galvanized plates in December, but that the demand for galvanized iron pipe had declined, due, it is presumed, to the slowing up of general building operations.

TORONTO—Jan. 12

Peat as a Coal Substitute because of the shortage of the latter has been receiving serious attention from the operators. A. A. Cole, mining engineer for the Temiskaming & Northern Ontario Ry., has been investigating the peat bogs along the line. Last August, samples of a peat bed, a few miles south of Cochrane, were sent to the fuel-testing laboratory of the Mines Branch, Ottawa, the results of testing being considered sufficient to warrant further investigation. Since then A. Anrep, of the Mines Branch, has made a survey of the peat bogs near Cochrane and is of the opinion that the peat of most of these deposits will make good fuel. The scarcity and increasing cost of coal render it probable that an attempt to bring these deposits into the market on a commercial basis might be attended with more success than those made some years ago.

Extracting Potash from Feldspar is being demonstrated at the preliminary plant of the National Potash Corporation, Ltd., in charge of Alan Grauel, inventor of the process; it is stated to be turning out potash at the rate of one ton per day. A commercial plant is under construction at Gravenhurst, Ont. The tests are stated to have shown that an average of 88% of the potash contents of the feldspar can be volatilized in a small furnace and that the cost of manufacture will not be more than $13 per ton. The United States Government is said to have placed orders with the company for two tons of potash per day for the next two years to be used for making permanganate of potash, and the British Government has also made application for a supply.

The Mining News

ARIZONA

Greenlee County

ARIZONA COPPER (Clifton)—Coronado mine, where the fire recently occurred, is now being drained and preparation made for resumption of work.

SHANNON COPPER CO. (Clifton)—Directors voted to purchase new property, consisting of 11 mining claims aggregating 200 acres situated 100 miles west of Clifton after 18 months' development.

Mohave County

UNION BASIN MINING CO. (Golconda)—Has ceased operations in this district.

Pinal County

FORTUNA CONSOLIDATED (Superior)—Drift on north-south vein now in 800 ft. and according to calculations is expected to strike the intersection of east-west copper vein series any day. Copper is expected.

MAMMOTH DEVELOPMENT (Shultz)—Repairing damage done by fire in shaft in October.

Yavapai County

JEROME VERDE (Jerome)—Policy for development will be by crosscuts and drifts from the 1100-ft. level, but diamond drilling will continue. This view was formed as the conclusion of geological study and plan for best results obtainable with available development fund.

Yuma County

POTASH reported 30 miles north of Parker in underground basin in form of brine. Explorations show basin covers area six miles in diameter, situated near Colorado River but not connected.

ARKANSAS

Marion County

CANE SPRINGS (Buffalo)—Dixie Queen Mining Co. operating Cane Spring mine, on Warner Creek, opened a rich deposit of blende in tunnel at 60-ft. level.

EASTERN STAR AND GOLDEN SEAL (Yellville)—Development has been started by Miami-Yellville Mining and Milling Co.

COLORADO

Clear Creek County

WASATCH-COLORADO (Georgetown)—Shipping lead concentrates and zinc ore.

GUM TREE (Idaho Springs)—Leasing company making shipments.

KITTY OWSLEY (Waldorf)—High-grade lead ore being shipped by lessees.

PRIMOS CHEMICAL CO. (Empire)—Snow slide in Daily district recently carried away 20,000 ft. of framed mill timbers. No one hurt.

BIG FIVE (Idaho Springs)—Lessees on this and Lake mine operating through tunnel, making regular shipments. New lease on Bellman to be worked also through this tunnel.

BAGELEY LEASING CO. (Idaho Springs)—Operating Bald Eagle, making test runs at Jackson mill; results satisfactory. Large tonnage of low-grade ore opened; regular shipments will begin soon.

Gilpin County

SILVER DOLLAR (Central City)—Shipping gold-silver-copper ore. Shaft sunk 100 ft. deeper; good-grade ore opened.

OPHIR (Central City)—Quartz Hill mine being operated through lateral from Argo tunnel; milling and smelting ore produced.

GOLD CUP (Central City)—Electric power recently installed. Main shaft will be sunk 200 ft. deeper. Large tonnage gold-silver-lead ore opened in development on Buckeye vein.

Ouray County

CAMP BIRD (Ouray)—Main tunnel being driven at rate of over 400 ft. monthly; now in 8500 ft.

GUSTON (Ironton)—Will be reopened through lateral from Joker Tunnel; former silver-copper producer in 1893.

WHITE CLOUD (Ironton)—Tunnel level retimbered; shaft being unwatered and repaired. Early-day producer, and supposed to be on extension of Guston vein.

MOUNTAIN TOP (Ouray)—New 3000-ft. tram from mine to Governor Basin completed. Concentrates and supplies can be transported all winter with little danger from snow slides.

Pitkin County

HURRICANE (Aspen)—Good-grade oreshoots of lead-silver were opened in driving along contact between white and blue limestones. Drift will be continued 200 ft. farther to cut oreshoot opened in old Climax shaft, where work was done in early days of Aspen. Properties in Highland district, on Richmond Hill.

San Juan County

ASPEN (Silverton)—Lessees making regular shipments from this Hazelton Mt. mine.

RUBY-CASCADE (Silverton)—Tungsten property, will be reopened by Holman & Grimes.

LAKE (Silverton)—Good-grade copper-silver ore recently discovered in this old Red Mountain mine being opened by lessees.

SUMMIT (Silverton)—Shipping ore during summer from Koehler tunnel workings. Development will be continued throughout winter.

ST. PAUL (Silverton)—This Red Mountain property being worked by lessees. Ore deposit is in form of pipe or chimney, common in district.

San Miguel County

LIBERTY BELL (Telluride)—New air compressor being installed.

ALTA (Telluride)—Extensive improvements and additions to mine and mill buildings being made.

CARRUTHERS (Telluride) — A leasing company is operating a portion of Smuggler-Union property. New Huntington mill added to mill equipment recently.

CARBONERO (Telluride)—Lower tunnel in 2700 ft.; good-grade ore opened. Will raise to upper level, 600 ft., where good-grade ore also opened. Electric drills will be used.

Summit County

ELLA B (Breckenridge)—Lessees shipping high-grade lead ore.

MUTUAL CO-OPERATIVE CO. (Kokomo)—Operating in Kokomo district; making regular shipments.

FRENCH GULCH DREDGING CO. (Breckenridge)—Good cleanups being made by company's dredge operating in French Gulch.

PRIMOS CHEMICAL CO. (Vanadium)—Reduction plant operating full capacity. Average of nine cars of product weekly being made.

POWDER RIVER GOLD DREDGING CO. (Breckenridge)—So-called "Evans" dredge completed by Yuba Manufacturing Co., of California. Capacity, about 4000 cu.yd. per day. Attempt will be made to operate throughout winter.

Teller County

ORPHA MAY (Cripple Creek)—Being worked by Patterson-Bradley Leasing Co.

ISABELLA (Cripple Creek)—Good-grade ore opened on Buena Vista vein on 16th level.

ROOSEVELT TUNNEL (Cripple Creek)—Heading still in syenite struck in October. Ground extremely hard.

ELKTON (Cripple Creek)—Regular shipments made by lessees in Elkton mine workings. Shipments also made from dumps and from Tornado workings.

MILLASIER MINING CO. (Cripple Creek)—Clyde shaft sunk to 1300-ft. level; station being cut at 1100-ft. level. Shaft sunk 500 ft. since July, and will be sunk to 1600-ft. level.

STRONG (Victor)—Main shaft sunk to 1700-ft. level, being lowest elevation in district, although not the deepest shaft from collar to sump. Regular production being made.

SPECIMEN AND SACRAMENTO (Cripple Creek)—Five-year lease secured on this Stratton Estate mine. New headframe being built, and larger hoist to be installed. Shaft will be sunk 400 ft. deeper, and extensive lateral development work done.

IDAHO

Shoshone County

BUNKER HILL & SULLIVAN (Kellogg)—The United States District Court at Portland, Maine, on Jan. 14 granted a temporary injunction in favor of the American Smelting and Refining Co. in its case against this company smelting certain B. H. & S. ores in its new smeltery.

INTERSTATE-CALLAHAN (Wallace)—Shaft sunk beyond 800-ft. level, which is 800 ft. below working or No. 4 tunnel and about 1800 ft. from the surface. Oreshoot cut and drifted up over 100 ft. on 800. It is about 12 ft. wide and of practically same grade as in upper workings. Shaft now nearing 900-ft. level, which will also be opened, the policy being to keep development well in advance of production. Mill feed after sorting high-grade ore averages about 21% zinc. Maintaining shipments at about 6000 tons per month.

MORNING (Mullan)—This mine, of Federal Mining and Smelting Co., of Wallace, will be ready for resumption about Jan. 12; shut down about one month ago for repairs in shaft, damage being caused by movement of surrounding ground. About half of full force of 600 men were retained on repairing shaft and outside work. Considerable difficulty expected in getting back a full force, but will be possible owing to closing of Green Hill-Cleveland, another Federal property, from which men will be transferred.

MICHIGAN

Copper

SENECA (Calumet)—Probably begin to sink shaft middle of January.

QUINCY (Hancock) — Exploring 3000 ft. on level No. 39 close to Hancock.

BEAR LAKE POOL (Calumet)—Down 20 ft. in overburden to ledge at No. 5 hole; started drilling Jan. 7.

VICTORIA (Victoria) — December tonnage shows falling off due to great snow fall absorbing water of shallow Ontonagon River crippling hydro-pneumatic plant.

FEDERAL SYNDICATE (Calumet)—Secured several more options; will start diamond drilling at Sec. 3-55-34, about Jan. 2.

CHEROKEE (Houghton)—Closed down completely until conditions improve, owing to high cost of labor and material. Shaft, 450 ft. deep.

BEAR LAKE POOL (Calumet)—Diamond drilling stopped during holidays; men taking vacation; will start No. 5 hole when they return.

ISLE ROYALE (Houghton) — Reached 33rd level with No. 2 shaft and 9th level with No. 7. Tonnage below 2700 daily; number of men decreasing.

OSCEOLA (Osceola)—December tonnage 100,000, same as for November, which had one working day more. North Kearsage ground opened sufficient for some time. La Salle line reached by 44th level and stoping will be begun.

FRANKLIN (Demmon)—The Mechanical haulage and system of mining introduced by Superintendent Henderson reduced number of trammers from 110 to 40.

AHMEEK (Ahmeek)—December, 104,000 tons, compared with 106,000 in November and 108,000 in October. Storage-battery locomotive running. Ten mules at shafts No. 2 and No. 1.

WHITE PINE (White Pine Mine)—November tonnage was 18,000, as compared with 20,700 for October and 15,000 to 16,000 as general monthly average for the year, with 20,900 tons as a record.

NEW ARCADIAN (Houghton)—Drifting in both directions on 1850-ft. level just reached; crosscutting east to ascertain contents of No. 8 conglomerate mineralized in several places.

MASS (Mass) — Purchased second-hand General Electric storage-battery locomotive refitted with new batteries and rebuilt; if it proves successful will order others. Daily ore tonnage about 1000.

LAKE (Lake Mine) — Knowlton lode drifted 500 ft. southerly to South Lake; northerly about 700 ft. out of about 4000 ft. in average ore. Lake lode developed ahead for long time. Fiscal year Apr. 30 yield as good as for that previous.

SENECA (Calumet)—Engine and boiler house erected boilers in position and steam started in one. Boarding house will be running in few days; dwelling houses now being painted. Will start hoist early in January.

CALUMET & HECLA (Calumet)—December daily tonnage, including that of Tamarack, 10,019; for two days following Christmas dropped to 8927 and 9990. Received 12 Goodman storage-battery locomotives; 32 ordered; remainder expected this month; but all will not be running until May, due to slow delivery of accessories.

NEW BALTIC COPPER CO. (Houghton)—Has undertaken the exploration of the New Arcadian vein from the bottom of its shaft, now 275 ft. deep. Drifting north and south has been done approximately 400 ft. from breast to breast and good copper grades disclosed. Rich copper has been found in places through the vein but at no great width, being only from three to eight or nine feet.

Iron

OLIVER IRON MINING (Crystal Falls)—Started a diamond drill on property near the Michigan Iron and Land Co.'s property on the SE ¼, NE ¼, Sec. 12. Ore was found some years ago by drilling.

M. A. HANNA CO. (Wakefield)—Purchased the revolving drier of the Jones Furnace Co., Marquette, which has been dismantled and will be used for drying ores. The cylinder is 60 ft. long and 6 ft. in diameter and was used in the experimental tests of the Jones process of reducing low-grade iron ores.

MINNESOTA

Cuyuna Range

ONAHMAN (Ironton) — Installing new electrical equipment at Algoma shaft.

JOAN (Ironton)—Sinking new shaft on property in Sec. 34-47-29.

LITTLE RABBIT IRON CO. (Ironton)—Shaft sinking on W½, NE¼, Sec. 5-29-46.

HILL MINES CO. (Ironton)—Operating diamond drills on SE¼, SE¼, Sec. 2-46-29.

HILL MINES CO. (Ironton)—Preparing to remove overburden from Sec. 11-46-29 NE¼, NW¼, to dump half mile distant.

BESSEMER IRON CO. (Ironton)—Shaft sunk 50 ft. Will bottom in manganiferous iron ore. Surface buildings, office and shops completed.

JOHN BRENNAN (Superior, Wis.)—Lease taken on N½, NE¼, Sec. 10-46-29 at 50c. royalty, with 10,000 tons minimum production.

CROSBY EXPLORATION CO. (Crosby)—Operating two diamond drills on Sec. 28-47-29, SW¼, SE¼, drilled 11 years ago. Being redrilled to ascertain manganiferous ore possibilities.

CUYLER ADAMS (Deerwood)—Operating diamond drill on NE¼, NE¼, Sec. 32-47-29. Also optioned Sec. 20-46-29 W½, NW¼, for exploratory purposes.

CUYUNA-MINNEAPOLIS IRON CO. (Ironton)—Secured lease covering SW¼, SE¼, Sec. 23-47-29. Royalty, 45c. per ton, with minimum production of 25,000 tons per year.

Mesabi Range

SACHEM IRON CO. (Eveleth)—Burns mine developed so that it can ship next season. Morrow mine adjoining the Burns also to be worked by this company. The Pickands-Mather interests will handle the ore from these mines.

HANNA ORE CO. (Virginia)—Shaft sunk on Fay property to remove the ore left by the Oliver when they gave up its lease. All the ore removed so far has been taken out through the Alpena pit No. 2. Drills have been working south of the Alpena on the Enterprise "40," checking the old drilling.

FAY (Virginia)—Hanna Ore Mining Co., operators, have sunk shaft to remove underground ore left by Oliver company when it gave up lease. So far ore has been taken out through Alpena pit, No. 2. Check drilling on Enterprise "40," south of Alpena mine; large orebody known to exist and if high enough grade proved it may be developed in near future.

OLIVER IRON MINING (Virginia)—New dock for reception of coal for engines and steam shovels at the Missabe Mountain openpit is about complete, and is the most modern structure of the kind on the Range. The whole structure is automatic. A train of six cars may be dumped by air. The dock is supplied with a sand pocket, as well as a tank of hot salt water for the sprinkling of cars in cold weather. The dock is 470 ft. in length and at an elevation of 35 ft. It has 12 coal chutes and was wholly constructed in a period of two months.

MISSOURI

Joplin District

RICH STRIKE (Quapaw, Okla.)—Completed drilling of tract southeast of here; will start shaft and mill building at once.

GOODWIN BROS. (Baxter)—Building 250-ton flotation plant at Blue Mound mine; includes two flotation machines, ball mill and seven sludge tables.

WILSON (Quapaw, Okla.)—Will start shaft sinking and mill building at early date on tract, where good drill strikes have been made recently.

UNDERWRITERS (Joplin)—Cut air drift at No. 2 mine, east of Picher, Okla., and property will soon be operating at full capacity. Ore taken from one shaft averaged 19% and mine promises to be unusually rich.

AMERICAN METAL (Joplin)—Started sinking first shaft on Hartley land west of Baxter Springs, Kan., on tract recently taken over from Butte & Superior interests; 17-in. drill hole being put down for Pomona pump.

MONTANA

Broadwater County

ECLIPSE-ARGO MINE (Hell Gate)—New crosscut completed; shaft sunk 100 ft. below tunnel. Electric power. High-grade copper ore.

Granite County

PHILIPSBURG MINING CO. (Philipsburg)—The buildings are completed and a large part of the machinery installed for the new 400-ton plant that in the course of a few weeks more will be treating the low-grade manganese ores from this district on two shifts. There have been delays in delivery of machinery.

Jefferson County

NEW STRIKE (Elkhorn)—High-grade silver ore near old Elkhorn mine. One shipment to smeltery.

AMALGAMATED SILVER MINES CO. (Clancy)—Old shaft on Free Coinage retimbered and deepened toward 300-ft. depth. Averaged high in silver.

MT. WASHINGTON (Wickes)—Two carloads silver-lead ore per day from tunnel, at vertical depth of 800 ft.

Lewis and Clark County

HELENA MINE (Helena)—Two carloads a week to smeltery. Net smelter returns, $20 per ton. Two-ton skip in 300-ft. shaft.

THOMAS CRUSE DEVELOPING CO. (Helena)—Mining and shipping gold ore from 500-ft. level to smeltery.

SCRATCH GRAVEL GOLD CO. (Helena)—Stoping on 300-ft. level. Three carloads a month to smeltery.

ECONOMY MINE (Helena)—Developing ore vein from levels in 300-ft. shaft. Showings favorable.

GOULD PLACERS (Rimini)—Blind lead discovered; showing good assays in gold and silver.

Silver Bow County

BUTTE & SUPERIOR (Butte)—Hearing of appeal in case of Minerals Separation Co. vs. Butte & Superior Mining Co., set for Mar. 8 at San Francisco, Calif.

BUTTE-DETROIT (Butte)—The Ophir mill is expected to be in a position soon to handle a large amount of manganese ore from Butte and Philipsburg mines.

NEVADA

Lander County

NICHOLS-LAYNG CHEMICAL CO. (San Francisco, Calif.)—Is producing about 5 tons daily of assorted shipping ore from antimony mine, 11 miles south of Austin, Nev., in Dry Canyon, which leads into the Reese River Valley, but developments of last few months have put property in position to produce 40 tons of 20% ore daily for several years to come, according to Harai R. Layng, secretary of the company, at Kirkwood Ave. and Quint St. This company controls the property and treats the ore by an automatic volatilization process developed by Mr. Layng, and also in a modified reverberatory furnace. Company states that its oxide averages over 98% Sb_2O_3 and its metal often analyzes 99.9% Sb.

Nye County

TONOPAH ORE PRODUCTION for week ended Jan. 5, 1918, amounted to 10,178 tons, valued at $178,115, compared with 8715 tons the previous week. Producers were: Tonopah Belmont 2285 tons, Tonopah Mining 2900, Tonopah Extension 2380, Jim Butler 746, West End 1247, MacNamara 517, Montana 42, miscellaneous 61 tons.

WHITE CAPS EXTENSION (Manhattan)—Drift east from 400-ft. level now 50 ft. from shaft.

WHITE CAPS (Manhattan)—Production continuous and mill being remodeled for changes in cyanide treatment.

MANHATTAN CONSOLIDATED (Manhattan)—Raise between third and fourth levels, distance 60 ft. entirely in mill-grade ore. South crosscut from third level extended in search of Mud vein expected 40 ft. beyond present face. Shaft to be deepened to 600 ft. upon arrival of pump for 400-ft. level and shaft timbers.

MANHATTAN AMALGAMATED MINES SYNDICATE (Manhattan) — Transfer of title consummated on Jan. 1, from Union Amalgamated to Manhattan Amalgamated Mines Syndicate. Outstanding stock to be exchanged share for share upon payment of an assessment of 2c. per share levied by the new board at first meeting for $20,000 development fund. Retimbering and a general cleaning in the mine is in progress.

White Pine County

CONSOLIDATED COPPER MINES (Kimberly)—Mill shut down for repairs on Jan. 1, and 200 men laid off. Development will proceed at Morris mine.

NEW MEXICO

Sierra County

VICTORIA CUTTER (Cutter) — This group of patented copper claims are to be reopened.

UTAH

Beaver County

MAJESTIC (Milford)—Producing from gloryhole at Old Hickory, productive for many years. Opened 300 ft. long by 92 ft. deep, and from 18 to 48 ft. in width. Orebody is low-grade copper, proved in one place to depth of 250 ft. Shipping about 1000 tons monthly. In December shipped 21 cars and in November about 19 cars.

Juab County

DESERET MOUNTAIN (Tintic Junction)—Shaft sunk to 300-ft. point, being continued to 500 ft.; station cut. Conditions between 127-ft. level and 300-ft. indicate ore to be richer and stronger with depth. Two or three cars shipping ore on dump, awaiting better transportation facilities.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Shipping copper ore from Silver King tunnel above main tunnel. Winze being sunk on Braine fissure, and mineralization continuing here.

CARDIFF (Salt Lake) — Shipping from stockpile at Lovendahl south of Murray at rate of about 350 tons a week, although no ore being sent down from mine to bins at South Fork, owing to bad roads.

EMMA CONSOLIDATED (Alta)—New hoist in operation and expected to ship one car of ore daily. Ore in winze from third level improving with depth. Connections between second and third levels—made to develop ore located by diamond drilling—completed, and stoping begun.

PERUVIAN COPPER (Alta)—Property has been producing about a car a month recently, although capable of larger output—car or two weekly—from body of carbonate ore stated to have been opened to width of 20 to 30 ft. Work to be suspended during winter and resumed with energy in spring, when regular shipments hoped for. Property adjoins Oxford and Geneva with record of production in early days.

Summit County

NEW QUINCY (Park City)—Old board of directors elected: W. S. McCornick, A. L. Thomas, W. R. Hutchinson, Herman Bamberger and others.

THREE KINGS (Park City)—Shaft being sunk for underlying Ontario quartzite contact now down to 650-ft. level, bottom in blue-gray limestone. Crosscut to be driven at 700-ft. point, and proposed if necessary to sink to 800. At 600-ft. point streak carrying magnetite and talc cut.

C. C. CONSOLIDATED (Park City)—First payment on sale of this property made and balance due in 30 days from Dec. 24. Price said to be $300,000. Silver King Consolidated thought to be interested, as new Thaynes Canyon tunnel of this company will tap this ground.

CALIFORNIA-COMSTOCK (Park City) First payment for property made Dec. 24, $150,000. Remaining $150,000 to be paid Jan. 24. Silver King Consolidated rumored to be behind purchase. Company has outstanding debts of about $100,000, now being met, and remaining $200,000 will give stockholders 30c. a share. Sale made owing to fall in price of lead, difficulty of disposing of treasury stock in falling market and increased costs.

SILVER KING CONSOLIDATED (Park City)—Special stockholders' meeting called to amend articles of incorporation to permit of increase of capitalization from $700,000 to $1,000,000. Change said to be contemplated owing to reported purchase of California-Comstock. Shipping 40 tons of crude ore and concentrates daily. Estimate of 1917 production: 5,600,000 lb. lead; 508,000 oz. silver; 280,000 lb. copper; and 450 oz. gold. Spiro tunnel in Thaynes Canyon section making good progress.

Tooele County

WESTERN UTAH COPPER (Gold Hill)—Shipping 200 to 250 tons daily, said to carry about 4% copper.

SEMINOLE COPPER (Gold Hill) — Promising vein carrying copper of shipping grade opened at 135 ft. from surface by drift sent out to cut second tungsten vein. Company has been concentrating on production of rare minerals, and making shipments of tungsten from time to time. One shipment of molybdenite made also. Considerable low-grade tungsten ore on dump, and 50-ton mill recently purchased expected to be ready for operation by spring. Stated to be 12-ft. vein in one place carrying molybdenite. Silver-lead ore also found. New discovery of copper ore being developed.

WISCONSIN

Zinc-Lead District

WISCONSIN ZINC CO. (Platteville)—Copeland mill equipment completed at Shullsburg.

IDA BLENDE (Benton)—Has been reopened; mill equipment of Long Range moved and reconstructed.

KISTLER & STEPHENS (Platteville)—Report rich strike of zinc ore by churn drill on John Reilley land, three miles south of Platteville.

MILLER LAND (Dodgeville)—J. A. Fetterly, of Minneapolis, is opening up prospect carrying high-grade zinc ore in sheet formation, situated five miles southwest of the city.

CANADA

Ontario

BULLION SHIPMENTS from Cobalt for week ended Jan 5 were 250,079 oz. from the Nipissing and the Mining Corporation of Canada, with 149,565 and 100,704 oz. respectively.

O'BRIEN (Cobalt)—In 1917 produced 1,500,000 oz. silver.

DOME (South Porcupine)—Sinking of shaft from 800 to 1500 ft. will be done by the Longyear company under contract.

TRETHEWEY (Cobalt) — Option taken on 51 per cent. of the Castle Mining Co. in Gowganda at 20c. a share.

KIRKLAND LAKE (Kirkland Lake)—Closed down until spring, because of extreme cold weather.

KERR LAKE (Cobalt)—December production 203,048 oz. as compared with 205,552 oz. in November.

PATRICIA (Boston Creek)—High-grade ore in shaft to below 100 level. Management considering installation of small mill.

MILLER INDEPENDENCE (Boston Creek)—Mill closed down owing to lack of water supply.

PATRICIA (Boston Creek)—Second installment on purchase price paid; main shaft down 120 ft. with rich ore continuing.

PORCUPINE V. N. T. (Timmins)—Considering the installation of new mill of larger capacity. Developments on the 600 level satisfactory.

TECK HUGHES (Kirkland Lake)—Shaft down 600 ft. and at this level a crusher will be installed to handle all the ore from above.

McKINLEY-DARRAGH (Cobalt) — Oil-flotation plant closed down for winter as economic treatment cannot be made during the cold weather.

WEST DOME (South Porcupine)—Two stopes opened on third level; about 900 tons of $17 ore broken down; will be treated at Dome Lake mill, where additional machinery being installed.

TEMISKAMING (Cobalt)—Opposition to present management asking for proxies to put Sir Henry Pellatt in as president. He is now president of the Mining Corporation of Canada.

BRITISH AMERICA NICKEL CORPORATION (Nickelton, via Sudbury) — British government agreed to loan company £600,000 to expedite the production of nickel from this property for which reduction works are now being built.

SCHUMACHER (Schumacher)—Vein cut at 300-ft. level south of shaft stated to assay $8 per ton for width of 4 ft. Vein on 600-ft. level shows increasing gold content. Mill running at rate of about 150 tons per day.

McINTYRE (Schumacher)—Jupiter shaft reached 1000-ft. level. Drift at this depth from main shaft 1940 ft. distant being run to connect with it. New pumping equipment installed; Groch flotation machine will be installed.

DAVIDSON (South Porcupine)—Last portions of mill equipment arrived; expected to be completed in about one month. About $80,000 worth of milling-grade ore on dump and enough blocked out underground to keep mill operating for two years.

NIPISSING (Cobalt)—Estimated value of production during December was $340,793. Shipment of bullion from Nipissing and customs ore were estimated at $376,433. Shaft 63, idle for two years, being pumped out.

MEXICO

Sonora

GREENE-CANANEA (Cananea)—Properties were closed down for about six months in 1917, but produced 30,260,000 lb. copper, 807,247 oz. silver and 4643 oz. gold. Copper cost in 1917 was 14c. a lb., not including cost of shutdown. All but two blast furnaces have been set in operation since Dec. 10. At capacity can operate eight blast and two reverberatory furnaces. The idle equipment will be blown in just as soon as some needed repairs have been completed.

BELGIAN CONGO

UNION MINIERE DU HAUT KATANGA (Elizabethville)—December production, 5,335,132 lb. of copper.

CHOSEN

ORIENTAL CONSOLIDATED (Unsan)—October production in gold $124,065 from 26,174 tons; ran 200 stamps 28.9 days. In November production was $138,630 from 25,882 tons. December cleanup is reported by cable at $134,350. Native labor is short but this situation is improving.

The Market Report

SILVER AND STERLING EXCHANGE

Jan.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Jan.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
10	4.7515	90⅛	45⅛	14	4.7515	90⅛	45⅛
11	4.7515	90⅛	45⅛	15	4.7515	89⅛	44⅞
12	4.7515	90⅛	45⅛	16	4.7515	89⅛	44⅞

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Jan.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
10	*23½	†	6½ @6¾	6.50 @6.60	7⅝ @7¾
11	*23½	†	6¾	6.50 @6.60 6.65	7 @7¾ 7
12	*23½	†	6¾ 6¾	@6.75 6.70	@7¾ 7
14	*23½	†	@7	@6.75 6.70	@7¾ 7
15	*23½	†	@7	@6.75 6.70	@7¾ 7
16	*23½	†	@7	@6.75	@7¾

† No market.

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17.5c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Jan.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
10	110	110	125	298	292	29½	54
11	110	110	125	295	289	29½	54
12							
14	110	110	125	295	288½	29½	54
15	110	110	125	298	291	29½	54
16	110	110	125	295	290	29½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515. £30½ = 6.4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50.9089c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Jan. 16, 1918

A further advance in lead and complete disappearance of any market in tin were the features this week.

Copper—The copper producers held a meeting on Jan. 10, at which was discussed the matter of making a new agreement as to price with the Government. A committee was appointed to make representations as to the desirability of advancing the price. It is well known that some of the smaller producers have been unable to earn any profit at the existing price, while as to the large producers it is represented that costs have increased from 1c. to 3c. per lb. since last September, wherefore, if 23½c. were the fair price then, the price now should be something like 2c. per lb. higher. No reply has yet been received from the War Industries Board.

Copper Sheets are quoted at 31½c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled. Copper wire is quoted at 26@27c. f.o.b. mill, carload lots.

Tin—There is a complete disappearance of supplies and no longer any way of even sensing the market. We are obliged to omit quotations simply for the reason that there is no market.

Lead—The good inquiry that began during the previous week continued and resulted in the transaction of a fair volume of business at advancing prices. The A. S. & R. Co. raised its price to 6¾c., New York, on Jan. 11. Since then January supplies in and near New York have realized as high as 7c., with 6¾c. quoted for shipment from the West and for March lead from near-by refineries.

The lead situation is very tight owing especially to the freight congestion and the large quantity of lead in transit. Lead is two months in coming from the Mississippi River to the Atlantic seaboard, against a normal time of six weeks. If these figures hold as averages, there is indicated a stock of about 100 thousand tons on wheels, against a normal of 25 to 30 thousand. There is plenty of lead at the points of production, but a great scarcity of refined lead in the markets.

Zinc—Very dull, with small transactions from day to day at substantially unchanged prices. There have been some inquiries in the market from abroad.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market is comparatively inactive at 37@39c. per lb. for No. 1 ingots at New York.

Antimony — Transactions were larger than for some time previous, but they were effected only at a concession in price. We quote spot at 14@14½c., and futures, at 13c., c.i.f., in bond.

Bismuth—Unchanged at $3.50 per lb., though some impure metal from South America is being sold under the price asked for the standard grade.

Cadmium—This metal is quoted at $1.50 @2.00 per lb., depending on the quantity.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Firm at $125 for spot and $115 to arrive. Small business was done at prices as high as $130@135. It is estimated that not over 100 flasks exist in stock in New York. San Francisco reports, by telegraph, $115, firm.

Gold, Silver and Platinum

Silver — This market continues very steady. The price at London declined ¼d. on Jan. 15, owing to slightly more offerings, but the silver supplies continue to be absorbed. New York price closed at 89⅝c., having declined in sympathy with the London market.

Mexican dollars at New York: Jan. 10, 73c.; 11, 73c.; 12, 73c.; 14, 73c.; 15, 72c., 16, 72⅜c.

Platinum—Active at $105. The supply is sufficient to meet the demands, but there is no excess. On Jan. 16 one of the refineries advanced its asking price to $108.

Palladium—Strong at $135.

Zinc and Lead Ore Markets

Joplin, Mo., Jan. 12—Report not received up to time of going to press.

Platteville, Wis., Jan. 12—Report not received up to time of going to press.

Platteville, Wis., Jan. 5 (Delayed)—Blende, basis 60% Zn, $60 base for premium grade down to $52 base for second grade. Lead ore, basis 80% Pb, $78 per ton. Shipments reported for the week are 3115 tons of zinc ore, 40 tons of lead ore and 580 tons of sulphur ore. Shipped during the week to the separating plants, 3504 tons of zinc ore.

Other Ores

Manganese Ore—Metallurgical ore is unchanged at $1.20 per unit.

Molybdenum Ore—Unchanged at $2.25@ 2.30 per lb. of molybdenum sulphide, basis 90%. Basis 85% is quoted at $2.20.

Iron Ore—Contracts continue to be made at the 1917 season prices, which are formally continued to Mar. 31, and a proviso is inserted in contracts calling for readjustment in case the Government revises prices.

Pyrites—Spanish lump is quoted at 15½c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports, but recent charters have exceeded these rates in several instances.

Tungsten Ore—Scheelite is quoted at $26 per unit. Wolframite, 70%, at $24@25; 65% at $22; 60% at $19.

Iron Trade Review

NEW YORK—Jan. 16

The uncertainties of Government prices are a brake upon market activity in every form of finished steel, says "Iron Age." Some lower prices have been quoted for export—3.75c., for example, on steel bars and shapes, and the domestic price of 3.50c., Pittsburgh, for bar iron.

Heavy snows and intense cold have made the breakdown of railroad service more complete in the last few days, and in the shutting down of operations the week has been probably the worst the steel industry has known. It is difficult to measure the loss of output. In the Chicago district the total pig-iron production for the last five days has been 30 to 40% of normal, with steel production somewhat more. Pittsburgh, Youngstown and Cleveland have probably had a 60 to 70% operation in steel. Eastern blast furnaces and steel plants have suffered severely from the blockades in other sections, which cut off coal and coke.

The complete shutdowns of some plants have been a matter of but two or three days, and this phase may pass quickly, but the piling up of freight will hamper mills for weeks, and since mines cannot ship coal unless cars come back as empties the fuel shortage will cripple the industry indefinitely.

The American Iron and Steel Institute's steel committee has just appointed a subcommittee to coöperate with the director-general of railroads in improving traffic conditions as they affect iron and steel works. This committee's immediate problem will be to move the huge accumulations of finished material that have brought many rolling mills to a standstill. Hundreds of thousands of tons of export steel is involved, and the ships to carry much of it await bunker coal.

The sharp cutting down of steel output points to a tighter drawing of the lines against less essential industries in the distribution of mill products. More labor would thus be turned upon imperative Government work.

What is most serious in any proposal affecting iron production, such as the order taking coke from merchant furnaces, is the loss of organization where the shutdown is complete. The alternative of repeated bankings of furnaces, while wasteful of coke, would obviate the scattering of working forces.

Pig iron is less affected than steel products by doubt as to future prices, and Cleveland has been the chief center of

activity. One interest there has made sales of 34,000 tons in the past week. An Ohio steel maker has bought 20,000 tons of basic iron for the last half and another has inquired for 15,000 tons for the first half. The new Erie, Penn., steel plant is now covered for 3000 tons a month through the year, deliveries beginning with March. A 15,000-ton sale of basic for the first half has been made at Philadelphia and 16,500 tons is wanted there by a steel casting company. An 8000-ton inquiry for foundry irons has come from the Navy.

PITTSBURGH—Jan. 15

The increase of 484,612 tons in the Steel Corporation's unfilled obligations during December appears quite anomalous as the general market throughout December had been very dull and the Corporation had shown monthly decreases averaging nearly 500,000 tons a month for seven months preceding. The increase is explained on the ground that the sheet and tin-plate contract bookings for the first half of this year were entered in December and the December shipments in general were light.

There can hardly be said to be any iron and steel market. Consumers show little interest in affairs generally, and least of all in fresh purchases, when deliveries on existing contracts are getting farther and farther in arrears. Production has been increasingly curtailed by the poor coke movement, resulting in blast furnaces banking and steel mills necessarily slowing down their operations. Ten days ago the railroads began declaring general embargoes against receipt of freight, in an effort to clear up the congestion, exception being made of blast furnace materials and perishable freight. The blizzard of last Saturday almost stopped passenger-train movement in some sections in the Middle West and of course halted the cleaning up in freight. It is now probable that the embargoes will be continued until further curtailment in steel-mill operations become necessary, by finished products accumulating. Steel-ingot production in December was at the rate of about 37,000,000 tons a year, against 43,000,000 tons in November and 45,500,000 tons in October, while the January production promises to be at a still lower rate.

The sworn returns as to average invoice prices on sheets, tin plates and iron bars, made in connection with bimonthly wage settlements, furnish interesting side lights on the market. The recent bar-iron settlement showed an average realized price of 2.95c. on iron bars shipped in the 60 days ended Dec. 20, whereas the market began to be quoted early last June at 4.50c., and the set price on iron bars is 3.50c. The sheet settlement, made Saturday, shows 5.50c. as the realized price in November and December, against 5.35c. in September and October and 5c. in July and August. In June the quoted market had advanced to 8c. or higher, while the set price, announced Nov. 5, is 5c. The tin plates settlement showed an average realized price in November and December of $8.60, the present set price being $7.75. By reason of the sliding feature of the scale, sheet- and tin-mill wages are now approximately double the base rates, while in the spring of 1915 they were between 10 and 15% under the base. Puddling is now $14.30 a gross ton, while for many years the rate generally ranged between $4 and $5 per ton.

Pig Iron—The merchant furnaces have been operating approximately the same as formerly, averaging an output 75 to 80% of capacity, shipments being made only with the greatest difficulty. The set prices are nominally in effect, but there is no iron to sell: Bessemer, $36.30; basic and No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight to Pittsburgh being 95c. in the case of valley furnaces.

Steel—The market is stagnant as there is no interest except in early deliveries and shipments are almost impossible. There is considerable shell-steel discard stock in the market, available at a trifle under the set prices for soft steel, which continue at $47.50 for standard billets, $51 for sheet bars and small billets, $50 for slabs and $57 for rods.

Ferroalloys

Ferromanganese—The market continues strong at $250, on account of very limited offerings.

Coke

Connellsville — Transportation conditions were showing signs of improvement last week, when the blizzard came at the end of the week, and car supplies this week are exceptionally poor. Set prices remain: Furnace, $6; foundry, 72-hour selected, $7; crushed, over 1-in., $7.30, per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Jan. 15
Alaska Gold M.	1⅞
Alaska Juneau	2⅛
Am.Sm.& Ref.,com.	79
Am. Sm. & Ref., pf.	105½
Am. Sm. Sec., pf., A	93
Am. Sm. Sec., pf. B.	‡96
Am. Zinc	13
Am. Zinc, pf.	42
Anaconda	61
Batopilas Min	1
Bethlehem Steel	75
Bethlehem Steel, pf.	90
Butte & Superior	17½
Cerro de Pasco	29⅜
Chile Cop.	15⅝
Chino	41½
Colo.Fuel & Iron	35
Crucible Steel	55½
Dome Mines	8½
Federal M. & S.	8
Federal M. & S., pf.	28½
Great Nor., ore ctf.	25⅛
Greene Cananea	39½
Gulf States Steel	86
Homestake	82
Inspiration Con.	42⅛
International Nickel	27
Kennecott	31½
Lackawanna Steel	74
Miami Copper	30½
Nat'l Lead, com.	43½
National Lead, pf.	98½
Nev. Consol.	18
Ontario Min.	4⅞
Quicksilver	‡.50
Quicksilver, pf.	‡1
Ray Con.	22⅛
Republic I.&S.,com.	73⅛
Republic I. & S., pf.	95
Sloss-Sheffield	38
Tennessee C. & C.	122
U. S. Steel, com.	90
U. S. Steel, pf.	108½
Utah Copper	78½
Va. Iron C. & C.	51½

N. Y. CURB†	Jan. 15
Big Ledge	1⅛
Butte & N. Y.	⅛
Butte C. & Z.	7⅛
Butte Detroit	⅛
Caledonia	.52
Calumet & Jerome	1⅛
Can. Cop. Corpn	1⅛
Carlisle	‡2
Cashboy	.05
Con. Ariz. Sm.	2
Con. Coppermines	6
Con. Nev.-Utah	‡⅛
Emma Con.	⅛
First Nat. Cop.	2⅛
Goldfield Con.	.40⅛
Goldfield Merger	.03⅛
Greenmonster	⅛
Hecla Min.	4⅛
Howe Sound	3⅛
Jerome Verde	⅛
Kerr Lake	5.10
Louisiana	.27⅛
Magma	37
Majestic	.25
McKinley-Dar-Sa.	.57
Milford	1
Mohican	‡⅛
Mother Lode	.25⅛
N. Y. & Hond.	12½
Nipissing Mines	8⅛
Nixon Nevada	⅛
Ohio Cop.	.93⅛
Ray Hercules	3⅛
Richmond	‡.56
Rochester Mines	.30
St. Joseph Lead	14⅛
Standard S. L.	⅛
Stewart	⅛
Success	.08
Tonopah	3⅛
Tonopah Ex.	1⅛
Tribullion	⅛
Troy Arizona	.11
United Cop.	.50
United Verde Ext.	36
United Zinc	1⅛
Utica Mines	.12
Yukon Gold	1⅛

SAN FRAN.*	Jan. 15
Alta	.03
Andes	.10
Best & Belcher	.02
Bullion	‡.01
Caledonia	.05
Challenge Con.	.04
Confidence	.08
Con. Virginia	.11
Gould & Curry	.01
Hale & Norcross	.01
Jacket-Cr. Pt.	.06
Mexican	.11
Occidental	‡.60
Ophir	.04
Overman	.02
Savage	‡.03
Sierra Nevada	.15
Union Con.	.02
Utah Con.	‡.01
Belmont	3.15
Jim Butler	.84
MacNamara	.15
Midway	.08
Mont.-Tonopah	.08
North Star	.04
Rescue Eula	.08
West End Con.	.67
Atlanta	.10
Booth	.04
Comb. Frac.	‡.02
D'field Daisy	‡.02
Florence	.13
Jumbo Extension	.22
Kewanas	.08
Nevada Hills	.05
Nevada Packard	.15
Round Mountain	.21
Silver Pick	.04
White Caps	.52
Big Jim	‡.75
United Eastern	3.80

BOSTON EXCH.*	Jan. 15
Adventure	1
Ahmeek	78
Algomah	.30
Allouez	50
Ariz. Com., ctfs.	12
Arnold	.20
Bonanza	‡.21
Butte-Balakiava	.30
Calumet & Ariz.	63½
Calumet & Hecla	440
Centennial	12
Copper Range	45½
Daly West	1½
Davis-Daly	5½
East Butte	9½
Franklin	4½
Granby	74
Hancock	8½
Hedley	13
Helvetia	‡.25
Indiana	.90
Isle Royale	20
Keweenaw	1
Lake	6½
La Salle	2⅝
Mason Valley	5⅞
Mass	6½
Mayflower	1⅛
Michigan	⅛
Mohawk	58
New Arcadian	1½
New Idria	13
North Butte	14½
North Lake	‡.51
Oilbway	.75
Old Dominion	42½
Osceola	61
Quincy	71
St. Mary's M. L.	52
Santa Fe	.65
Seneca	7½
Shannon	5½
Shattuck-Ariz.	16
So. Lake	1½
So. Utah	.12
Superior	4½
Superior & Bost.	3½
Trinity	3½
Tuolumne	1
U. S. Smelting	44
U. S. Smelt'g, pf.	44½
Utah Apex	2⅞
Utah Con.	10½
Utah Metal	2½
Victoria	2½
Winona	1½
Wolverine	34
Wyandot	.60

BOSTON CURB*	Jan. 15
Alaska Mines Corp.	.20
Bingham Mines	9⅛
Boston Ely	.56
Boston & Mont.	.42
Butte & Lon'n Dev.	.10
Calaveras	1
Calumet-Corbin	‡.01
Chief Con.	1⅞
Cortez	.05
Crown Reserve	.18
Crystal Cop.	.48
Eagle & Blue Bell	2
Gila Copper	17
Houghton Copper	.50
Intermountain	‡.70
Iron Cap, Com.	18½
Iron Cap Cop., pf.	‡14½
Mexican Metals	.30
Mines of America	1⅜
Mojave Tungsten	.14
Nat. Zinc & Lead	.20
Nevada-Douglas	.95
New Baltic	.90
New Cornelia	15⅛
Oneco	.30
Pacific Mines	‡.35
Rex Cons.	.10

SALT LAKE*	Jan. 12
Bannack	‡.26
Big Four	‡.01
Cardiff	2.50
Colorado Mining	.09
Daly	1.25
Daly-Judge	6.75
Empire Copper	‡1.17
Gold Chain	.09
Grand Central	.54
Iron Blossom	.47
Lower Mammoth	‡.03
May Day	.01
Moscow	‡.11
Prince Con.	.64
Rico Wellington	.16
Silver-King Coal'n	2.60
Silver King Con.	3.10
Sioux Con.	.02
So. Hecla	.60
Tintic Standard	‡1.45
Uncle Sam	.01
Wilbert	.15
Yankee	.02

TORONTO*	Jan. 14
Adanac	.11
Bailey	‡.05
Beaver Con.	.25
Chambers Ferland	.10
Coniagas	3.00
Hargraves	.10
La Rose	.28
Peterson Lake	.10
Temiskaming	.25
Wettlaufer-Lor.	.04
Davidson	.25
Dome Exten.	.10
Dome Lake	.13
Hollinger	5.00
McIntyre	1.45
Newray	.47
Porcu. Crown	.23
Teck-Hughes	.48
Vipond	16
West Dome	.13

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Jan. 15
Cresson Con.	4.87½
Doctor Jack Pot	.03½
Elkton Con.	.06½
El Paso	.17
Gold Sovereign	.02½
Golden Cycle	1.82
Granite	.44
Isabella	.06½
Mary McKinney	.06
Portland	1.06
United Gold M.	.15½
Vindicator	.27

LONDON	Dec. 18
Alaska Tre'dwell	‡£1 0s 0d
Burma Corp.	3 19 4½
Cam & Motor	0 10 6
Camp Bird	0 7 0
El Oro	0 8 0
Esperanza	0 7 9
Mexican Mines	5 18 9
Min. Corp. Can.	0 16 0
Nechi, pfd.	0 9 9
Oroville	0 18 6
Santa Gert'dis.	0 13 6
Tomboy	1 1 0

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb.	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug.	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855	87.332	23.925	32.361	44.324
Nov.	51.714	71.604	85.891	25.094	34.192	43.584
Dec.	54.971	75.765	85.960	26.373	36.410	43.052
Year	49.684	65.661	81.417	23.675	31.315	40.851

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	23.500	122.750	110.000	142.523	125.000
Nov.	30.625	23.500	134.659	110.000	155.432	125.000
Dec.	31.890	23.500	145.316	110.000	162.842	125.000
Year	27.202	27.180	116.059	124.892	138.281	138.401

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	61.851	179.307	247.467
November	44.109	74.740	186.932	274.943
December	42.635	87.120	183.368	298.556
Av. year	43.480	61.802	182.096	237.563

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042	6.249	6.945	6.187	30.500	30.500
December	7.513	6.375	7.405	6.312	30.500	30.500
Year	6.858	8.787	6.777	8.721	31.359	30.500

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.587	54.000
Sept.	8.990	8.136	8.820	7.966	52.095	54.000
Oct.	9.829	7.983	9.659	7.813	54.159	54.000
Nov.	11.592	7.847	11.422	7.672	56.023	54.000
Dec.	10.665	7.685	10.495	7.510	55.842	54.000
Year	12.804	8.901	12.634	8.813	72.071	52 413

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.58
October	24.61	37.25	21.26	33.95	21.51	33.95
November	30.07	37.25	28.18	33.95	26.55	33.95
December	35.16	37.25	30.95	33.95	30.79	33.95
Year	$23.88	$43.57	$20.98	$39.62	$21.15	$40.83

‡ As reported by W. P. Snyder & Co.